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MAY/JUNE 2003

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PRACTICAL WINERY & VINEYARD

MAY/JUNE 2003 • VOL. XXV, NO. 1

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EDITORIAL
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San Rafael, CA
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PRACTICAL WINERY & VINEYARD (ISSN 9739-8077) is owned and published by PWV Incorporated. Published bi-monthly at subscription rate of $31/year. Outside the United States, please add $10US, sea mail; $18US, air mail. Postmaster: Please send change of address to 58-D Paul Drive, San Rafael, CA 94903. Back issues: $5 prepaid. News media may use no more than ¼ page of material per issue provided that PRACTICAL WINERY & VINEYARD is credited.

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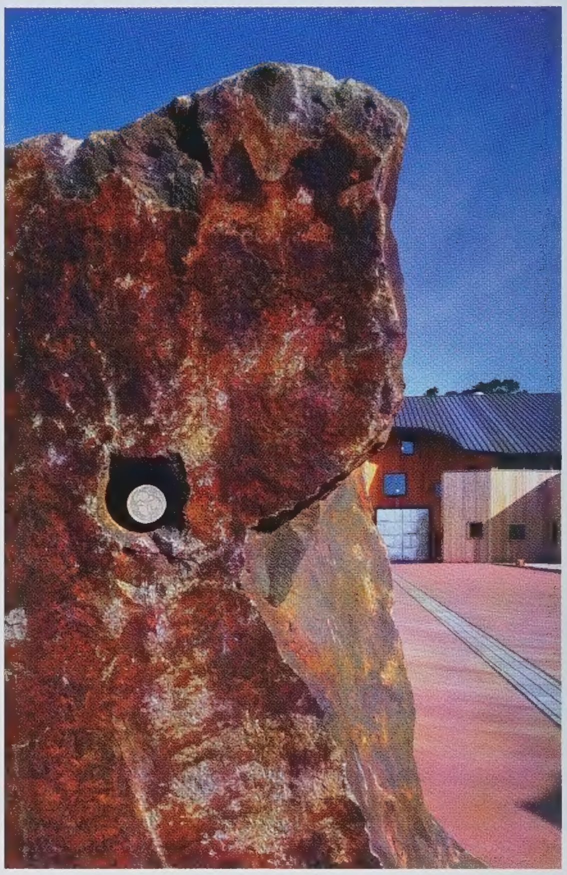

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"To stimulate continuing improvement in the wine industry."

SEEKING PARTNERSHIPS

Broad cooperative effort helps AVF move research forward

BY Tina Vierra

Today's American Vineyard Foundation (AVF) faces challenges of fundraising, information gathering, funds disbursement, and research-oversight that can only be solved by cooperative means, according to executive director Patrick Gleeson.

The AVF was originally created in 1978 to be a fundraising arm for the American Society for Enology & Viticulture, which by its non-profit charter could not actively raise funds. As a non-profit 501(c)(3) organization, AVF can actively raise funds for viticulture and enology research.

However, the AVF has since become far more than a fundraising organization. Working in tandem with groups that have a similar purpose, AVF raises research funds; compiles information on top industry concerns through surveys and other means; solicits, reviews, and funds research grants; coordinates research efforts with industry needs; and helps researchers deliver results to the industry.

Keeping track of money and research

Gleeson became executive director in 1995, and he enjoys a unique role as the man-in-the-middle of all these efforts. He's head coach, committee chair, guest speaker, surveyor, fundraising cheerleader, and the king of spreadsheets.

How much funding went to Pierce's disease and glassy-winged sharpshooter research in the last several years? Want a summary of all funds disbursed — to which research projects — in 2002/2003? Gleeson has a spreadsheet for everything.

Visit the AVF website (www.avf.org) — it has many spreadsheet-based charts detailing where the grape and wine industry believes research money should be spent, where it's gone in the past, and where it's going in the near future.

AVF runs on voluntary contributions from the wine and wine grape industry, and it's board of directors has lofty goals. "The AVF board is targeting $2 million in annual contributions," says Gleeson. "If we break $2 million, we will set our sights on $2.5.

"Ideally, we would like to build up our endowment balance, so the interest will support the industry's annual research needs. The account balance is $380,000, and we have a goal of $10 million for the endowment fund. We have our work cut out for us." Primary fundraising time for AVF is the spring of each year, between January and April, but contributions are welcome anytime.

Contributions are raised mainly by direct mail, primarily targeting growers and vintners who work cooperatively to raise funds for research. Growers can authorize vintners to deduct $1 per $1,000 in crop value from grower payments and grower deductions are matched by the vintners.

Since donations are voluntary, support can fluctuate from year to year, making it difficult for AVF to anticipate the next year's resources. In 2002, approximately 29% of growers (1,172 out of an estimated 4,000) and 13% of vintners (104 out of 800 in California) contributed funds to AVF.

The bulk of the largest wine/grape companies support the AVF, but the AVF would like to increase the percentage of contributors from all sources. Building of the endowment fund is vital to stretching AVF resources in the future.

Funding research projects

A template for the annual survey of industry concerns was one of the first things Gleeson developed. "I've been with AVF for eight years, and in

Table I

Top 10 enological concerns according to results of the most recent AVF survey:

1. Influence of viticultural practices on wine composition and flavor
2. Control of cork taint
3. Influence of winemaking practices on wine composition and flavor
4. Factors controlling stuck and sluggish fermentations
5. Color and phenolic constituents
6. Aroma and flavor constituents
7. Identification and control of sulfide production; sulfide removal
8. Alternative bottle closures
9. Yeast nutrient requirements and metabolism during fermentation
10. Control of microbiological contaminants during ageing

PWV to publish AVF research

AVF's charter is to fund research and to disseminate finished research work to the industry or the public at large. The AVF-board and Patrick Gleeson want to improve their outreach efforts. To that end, AVF has launched a new cooperative effort with ***PWV***.

"For the most part, when vintners and growers want to know the results of the research, they don't look to AVF," says Gleeson. "Although we fund the work, they look to *AJEV*, the *Grape Grower*, ***PWV***, and the Australian journals. Some of the research just isn't getting out there. We have funded some research for up to 12 years and the results aren't yet published. That needs to change."

Researchers explain that to stop working in the fields in order to write and publish is disruptive to the research cycle. They are not earning a living if their grant funds are cut off for one year because they miss a grant cycle in order to publish. Gleeson can't argue with these points, but nevertheless AVF needs to get the information into the hands of vintners and growers.

An AVF process, now in place, requires that all researchers must write up and publish their results within five years of completing a study. Researchers need to be accountable for delivering the information to the industry. Continued funding is in jeopardy if the information is sitting on a computer and unpublished.

In cooperation with the AVF, *Practical Winery & Vineyard* is taking on the role of industry outlet for as much AVF-funded research as it can publish. Gleeson and publisher Don Neel hope to work with researchers to bring results to print as quickly as possible when research is completed, getting information to vintners and growers promptly while allowing researchers to proceed with their work.

Coming up in 2003 in ***PWV***, look for research results from James Wolpert and Nick Dokoozlian, among others.

the early years, I was getting lambasted by researchers who said, 'You're not telling us what the industry's top priorities are.' They were getting turned down for research proposals on which they spent a lot of time and effort. They wanted to know, 'How can we find the target? How can we submit proposals for

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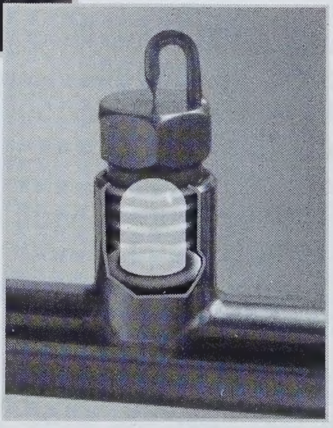

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Table 1: Top Viticultural Concerns in the U.S.

CATEGORY	Rank H=High, M=Medium and L=Low California	Mid Atlantic	Northeast	Northwest	Southwest	Southeast
PRODUCTION						
Canopy Management						
Improvement of canopy microclimate (disease control, fruit composition, quality enhancement)	H	H	H	H	H	H
Evaluation of vine training and trellising systems	H	H	M	H	H	M
Vineyard design (trellising, training, spacing)	H	H	M	M	H	L
Vineyard Mechanization						
Pruning	H	M	H	M	H	H
Mechanization systems	M/H	H	M	M	H	H
Weed management	H	H	M	M	H	H
Canopy management mechanization	H	H	M	M	H	H
Other						
Cold hardiness	*	H	H	H	H	M/H
DISEASES						
Fungal						
Powdery mildew	H	H	H	H	H	H
Downy mildew	*	H	H	L	H	H
Eutypa and other cankers	H	H	M	M	M/H	H
Black rot/phomopsis	*	H	H	L	H	H
Bunch rots	H	H	M/H	H	H	H
Botrytis	*	H	M/H	H	H	M/H
Sour rot	*	H	M	H	H	H
Bacterial						
Pierce's disease	H	M	L	M	H	H
Crown gall	M	H	H	M	H	H
INTEGRATED CROP MANAGEMENT (ICM)						
Integrated Pest Management — IPM (Chemical and alternative control of insects/mites)	H	H	H	H	H	H
Sustainable production practices	*	M	M	H	H	H
Cultural practices	*	H	M/H	M	H	H
PESTS						
Above Ground						
Leafhoppers (including sharpshooters)	H	M	M	H	M	H
Beneficials (spiders, wasps, etc.)	H	H	M	M	M	H
Vertebrates (deer, rabbits, voles, birds, etc.)	M	H	M	M	H	H
PLANT MATERIALS						
Existing Materials						
Rootstock evaluation:	H	H	M/H	H	M	M/H
Pest and disease resistance (phylloxera, nematodes, oakroot fungus, fanleaf virus)	H	H	M/H	H	M	M
Appropriate vigor	H	H	M	H	M	L
Cold hardiness	*	H	H	H	H	M
Fruit quality	H	H	H	H	M	M
Clonal evaluation (Testing existing clones, including newly imported clones)	H	H	H	H	H	H
Fruit quality	H	H	H	H	H	H
Regional adaptation	*	H	H	H	H	H
Disease resistance	H	H	H	M	H	H
Yield	H	H	H	H	H	H
Vigor	H	H	M/H	M	H	H
Variety evaluation	H	H	H	M	H	H
Improved Materials						
Pest resistance (phylloxera, nematodes, etc.)	H	H	M	H	M	L
Clonal improvement	H	H	H	M	H	H
Disease resistance (fanleaf virus, oakroot fungus, etc.)	H	H	M	M	H	H
Regional adaptation	*	H	H	M	H	H
Fruit quality	H	H	H	M	H	H
Yield	H	H	M	M	H	H
Rootstock Biology						
Rootstock response to pests and diseases (phylloxera, nematodes, oakroot fungus, etc.)	H	H	M	M	M	H
Rootstock effect on scion (vigor, fruit quality, fruit set, etc.)	H	H	H	M	M	H

research grants that will be viable and accepted?' At the same time, vintners and growers appreciated the opportunity to voice their concerns. So the survey process was needed."

As a result, researchers' proposals more accurately address grower/vintner needs and concerns. Gleeson can show researchers proposing projects rated near the bottom of the survey's industry priorities that their topic doesn't appear to meet industry needs. He can then offer guidance on an alternate proposal or on revising the current one. "A project may be good science, and we appreciate that, but it's got to be aimed at an industry need."

Each of these concerns is being addressed by at least one, and often more, research projects currently in progress and funded by the AVF. (See Table II for top regional concerns.) In 2002, however, only 33 of 102 proposed research projects received funding, divided between 20 for viticulture and 13 for winemaking.

With the survey tool in hand, Gleeson next addressed the best uses of the money AVF would raise. He looked to other programs and sources within California, and began building partnerships with related organizations to combine funds and conjoin similar research for the benefit of all.

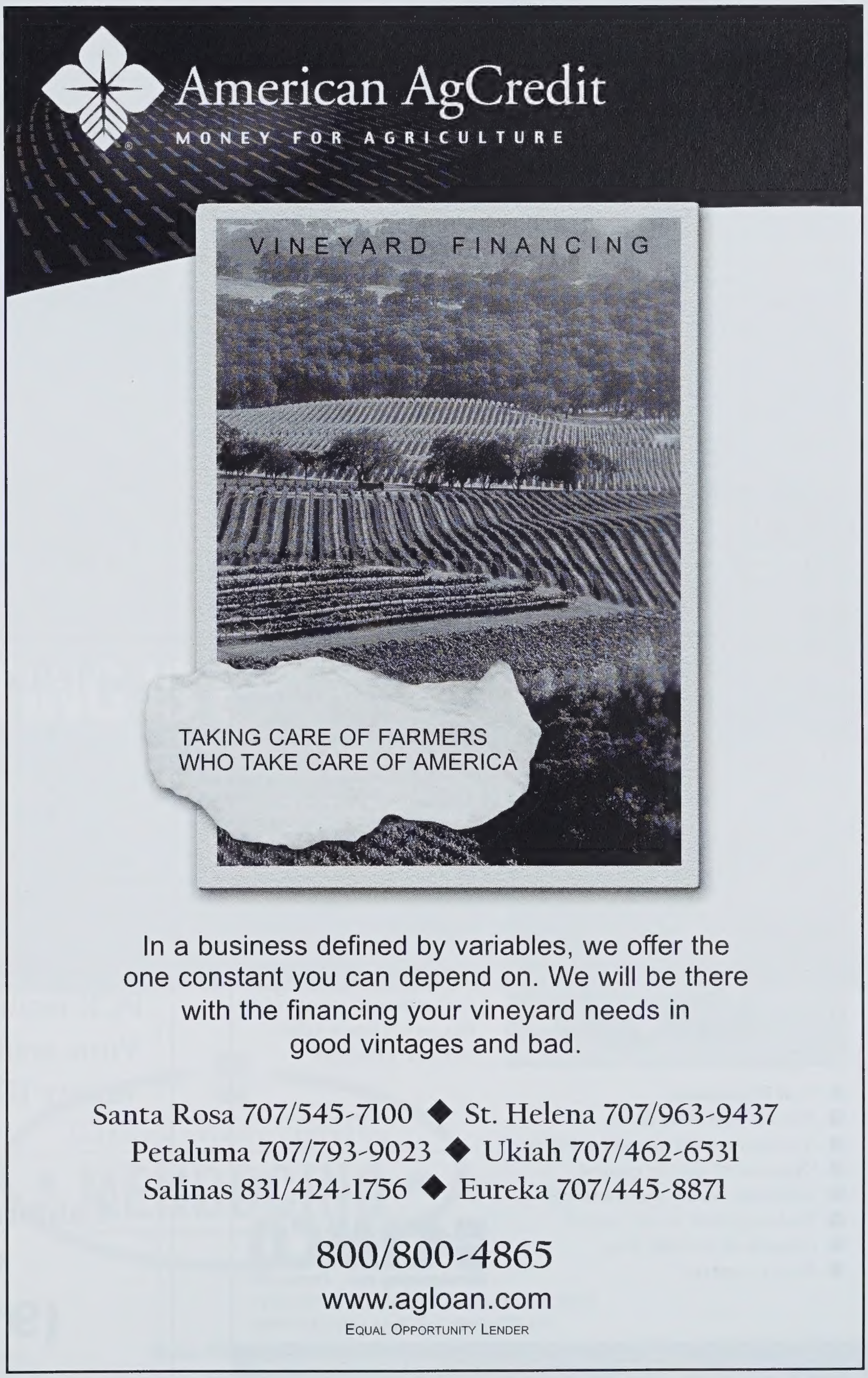
As a result, Gleeson is co-director of the California Competitive Grant program with UC Davis's Dr. Robert Webster and is an ex-officio member of the Viticulture Consortium Program. Working cooperatively with these state and federal funding agencies, such as the Rootstock Improvement Commission, the CA Raisin Board, the Table Grape Commission, and others, the AVF has been able to pool resources for common high-priority programs.

Stretching research dollars

Thanks to these partnerships, AVF's accessible funds rose from $1.4 million to $2.4 million in 2002. "We're focusing on the common, high-priority concerns for the wine and grape industry — making sure we are maximizing our investment," reports Gleeson.

Current research on Pierce's disease and GWSS is a prime example. AVF is managing the research evaluation process for the California Department of Food and Agriculture's (CDFA) Pierce's disease/glassy-winged sharpshooter board.

In addition, the AVF works closely with the CDFA, Animal and Plant Health Inspection Service, California Competitive Grant Program for Research in Viticulture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Top 10 Viticultural Concerns in California

Rank	Central Coast	Central Valley	North Coast	California
1	Rootstock improvement	Pierce's disease	Pierce's disease	Rootstock improvement
2	Pierce's disease	Sharpshooters	Sharpshooters	Pierce's disease
3	Sharpshooters	Beneficials (spiders, wasps)	Viticultural impact on fruit/flavor	Sharpshooters
4	Regulation of fruit development	Monitoring plant/soil water status	Influence of water status	Viticultural impact on fruit/flavor
5	Powdery mildew	Influence of water status	Eutypa and other cankers	Powdery mildew
6	Viticultural impact on fruit/flavor	Canopy management	Rootstock improvement	Regulation of fruit development
7	Influence of water status	Vine training/trellising systems	Monitoring plant/soil water status	Beneficials (spiders, wasps)
8	Beneficials (spiders, wasps)	Bunch rots	Rootstock selection and evaluation	Vine training/trellising systems
9	Crop load management	Nematodes	Canopy management	Canopy management
10	Canopy management	Nutrient requirements/critical levels	Regulation of fruit development	Crop load management

(For a lengthier explanation of each concern, see the AVF website, www.avf.org)

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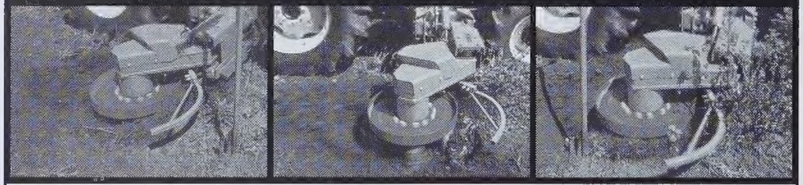

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and Enology, University of California (UC), U.S. Department of Agriculture, and the Viticulture Consortium. This effort has been very rewarding and productive. Eighty-three Pierce's disease and GWSS studies (totaling $14.8 million), large and small, have been realized by this huge cooperative effort over the past several years.

Does Gleeson ever feel bogged down in committees? "Yes, but the payoff has been incredible. Between all of the agencies, we get to that needed budget amount. It allows us to go further down the project list with a bigger pot of money, and as long as we all agree that a project is good science, and that it's meeting the needs of all those agencies, then we'll work together on it."

Working with top scientists

AVF has also looked outside California for more research partners. In 1996, a group called AVERN (American Viticulture and Enology Research Network) was formed to evaluate national grower/vintner research needs and concerns. The group brought together academics, cooperative extension personnel, and grape/wine industry members to gather data. Gleeson became technical committee chairman and was put in charge of the survey process to determine top industry concerns.

From contacts established during AVERN work and elsewhere, Gleeson has built ties between AVF and researchers in Washington State, Oregon, Nevada, New York, and Florida. He won't stop there.

AVF looks for partners in all major winegrowing regions. "We'll get to the northwest, and east coast," states Gleeson.

"There are winegrapes grown in every state now. Will we look to fund a trellising research trial in the midwest? No, not yet anyway. That project would have an impact on too narrow an area that would most likely not be applicable to California growers. But if the scientists are studying powdery mildew or Eutypa — a common, high-priority concern across the U.S., and it is a well-designed project and is the best science — yes.

"The key to identifying research expertise and funding partnerships outside of California is communication. There will always be regional differences for research, and we will not be able to agree on all issues. That said, as long as we agree and identify the common high priorities related to regional specific issues (across the U.S. and internationally), we can move forward with the matching funds process and discussion. The driving force in this process is working with the top scientists who provide California vintners and growers with answers to pressing questions. Research needs to be effective, efficient, and relevant."

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Various committees currently field about 125 research proposals. Gleeson expects the numbers to grow. AVF wants to review project proposals from Cornell, Washington state, Oregon, and anywhere else top enology and viticulture researchers and interested funding agencies are available.

In order for other states to determine what the enology and viticulture concerns were in their backyards, Gleeson provided his survey template, and told them to revise it for their own needs with input from researchers, industry members, and local media.

"I told the states, 'When you submit a survey and you get the feedback, researchers won't be confused. They're in the loop then, they're not surprised by the concerns that growers and vintners want research on. It's a communication tool, a two-way street.'"

Going beyond the U.S.

In 2003, AVF announced its intention to build partnerships even farther a field — in Australia. "We looked at some of the exciting stuff they're doing and approached them about research partnerships," reports Gleeson. "They're progressive and aggressive in how they address their research."

Australians have a different view of intellectual property. Fiercely national, they want research to benefit their industry specifically, if not exclusively.

Gleeson swapped "Top Concerns" lists with the Australians, and they compared notes. Then both sides signed non-disclosure agreements and cautiously passed over some of their research proposals to each other. Anonymity is key — no one knows who the research teams are, and both sides review the proposals with no politics, but with an eye to good science, matching funds, and coordinating research programs. Not surprisingly, they found some matches.

"Look, Objective A in your proposal links nicely with Objective B in our proposal. Let's get those two groups to talk and work together on this objective." Gleeson says this was very much what exchanges with the Australians were like. "At that point, AVF and the Australian funding agencies would step back and let researchers take over, cooperate, collaborate. From my perspective, our job is to initiate conversation between research groups. The science discussion and approach are the responsibility of scientists, not AVF."

An example of this cooperative effort is research on Eutypa. There is one cooperative research effort ongoing through the process described above with Dr. Russell Molyneux, U.S. Department of Agriculture, Agricultural Research Service, and Dr. Eileen Scott, Cooperative Research Center for Viticulture and University of Adelaide (Waite Campus). The cooperative effort is focused on: Eutypa Dieback — development of early diagnostic techniques.

"In the future, we are hopeful that a cultural trial on Eutypa looking at control through wound applications can be developed," explains Gleeson. "Ideally, both groups would use identical protocols in California and Australia. The result would be a continual study on a lead-follow basis, because the Australian growing season will follow the Californian season." Then there are two data sets every 12 months intead of just one.

"In addition to coordinating research efforts, we need to coordinate funding efforts. This has to be a funding partnership with the Australians — it cannot be a one-way street," adds Gleeson.

Whatever it takes to meet industry needs

Current AVF funding is 99% from California, so board members are careful to ensure that the research it funds meets the needs of California vintners and growers first and is the best science.

"We have some of the top scientists in the world here in California, and we need to continue to fund those programs," states Gleeson. "At the same time we are charged with looking at all funding options. If the science exists at Cornell, and it's the best science, we should fund that project. If it meets our needs, and it's in British Columbia or Washington or Australia — AVF does not care where a problem gets solved. We just want it solved. That's a change in mindset." ■

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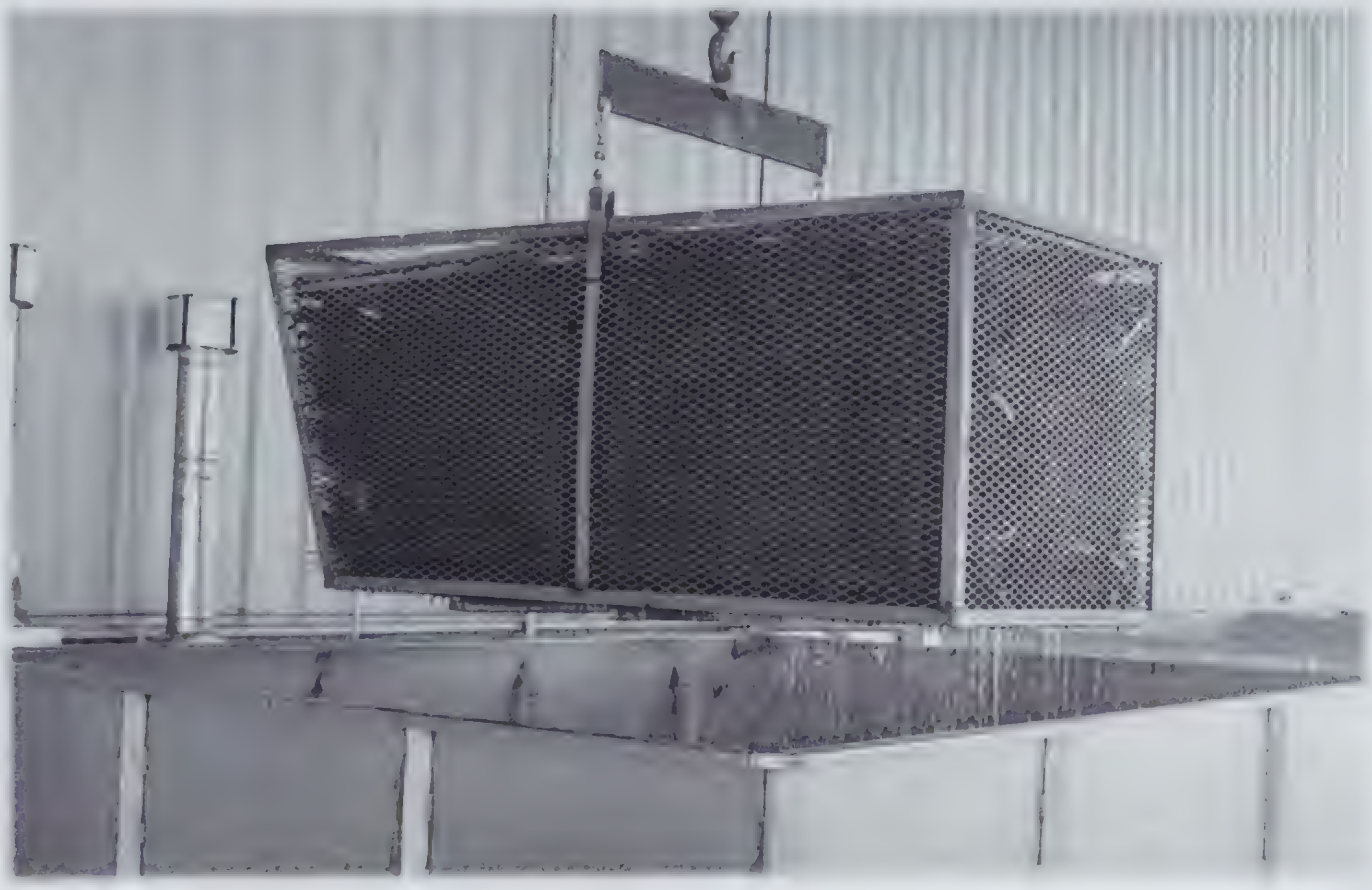

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COVER STORY

Potential solar radiation in a VSP trellis at 38⁰ N latitude

BY Stuart B. Weiss, Ph.D.,
David C. Luth,
Vineyard Canopy Analysis
Bibiana Guerra, Ph.D.,
Woodbridge Winery, Woodbridge, CA

Systematic, quantitative understanding of sunlight in vineyards can provide a solid foundation for optimizing viticultural practices. The spatial and temporal variability of insolation (*in*cident *sol*ar radi*ation*) drives microclimatic variability among and within plant canopies.[7]

Trellis design, row direction, and canopy growth can all be managed to influence daily and seasonal insolation regimes to optimize vineyard site-potential for quality and yield.[9,13,14]

Insolation exposure is critical for grape quality. Insolation directly heats grape clusters and affects ripening rates, since sugar and acid content are functions of accumulated temperatures and temperature range.[10]

Additional heat is particularly important for ripening in cool climates. At the opposite extreme, various degrees of heat damage can occur on hot days, most likely on grapes exposed to intense direct insolation during peak afternoon air temperatures.

This article addresses evaluation of insolation exposure on grape clusters in a vertical shoot positioned (VSP) trellis system using hemispherical photography. The resultant "insolation profiles" detail the hourly and monthly course of potential direct insolation for an east-west row and three other simulated row directions.

A production-scale trial comparing south-side fruit to north-side fruit demonstrates how these insolation differences translate into measurable wine qualities. This work was part of a larger project at Woodbridge Winery (in cooperation with Lodi, CA-area growers) to better understand the effects of trellis selection and row direction on vineyard microclimate and wine quality. Here we address the fundamental issues that lead to a common question in warm climate viticulture: "Regarding sun exposure, have we gone too far with the VSP trellis?"

"Grape's-eye view" – hemispherical photography

The insolation environments of plant canopies can be captured using hemispherical photography.[11] Digital image processing, using specialized software, precisely defines the geometry of open sky, and it projects sun paths on 180° hemispherical photographs (commonly called fisheye photos, as seen on cover of this magazine).

Potential direct and diffuse insolation over an entire season can be estimated from a single photo in the absence of major seasonal changes in canopy structure. The solar model used assumes that obstructions (leaves and shoots) absorb all insolation and that skies are clear.

Hemispherical photographs were taken near Lodi, on August 15, 2001, in a clean VSP vineyard on flat terrain with 8-foot vine spacing, 8-foot wide tractor rows, 34-inch cordon height, 6-foot top wire height, and 10-inch canopy width.

Ten photos were taken on each side of the trellis, at fruiting wire height as close to the grape clusters as possible. The camera was mounted on a self-leveling platform, and oriented to true north with a compass.

Photo I is the VSP trellis facing south from the bottom of the photo. Note that east (right) and west (left) are reversed because the image is looking straight upward. To the north is the vertical wall of dense foliage in the cordon, with only a few loose shoots extending out. Virtually no sky is visible north through the cordon, and almost half the sky is open to the south. The adjacent

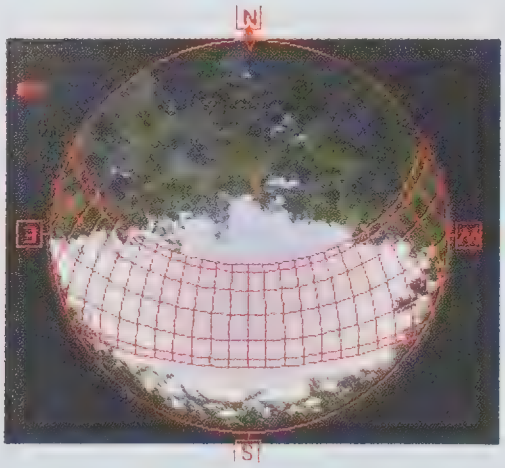

Photo I: VSP trellis facing south.

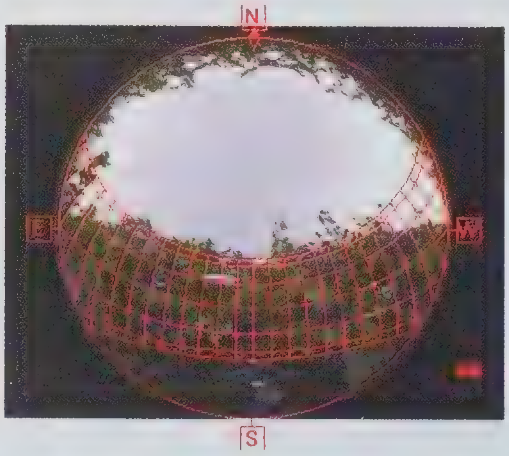

Photo II: North side of VSP trellis.

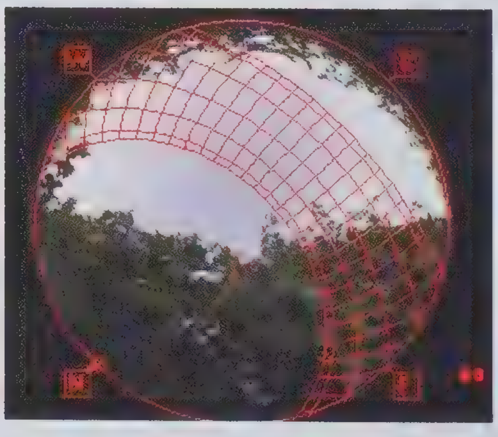

Photo III: Simulation of NE-SW orientation.

Hemispherical photography and specialized software simulate solar radiation in a vineyard.

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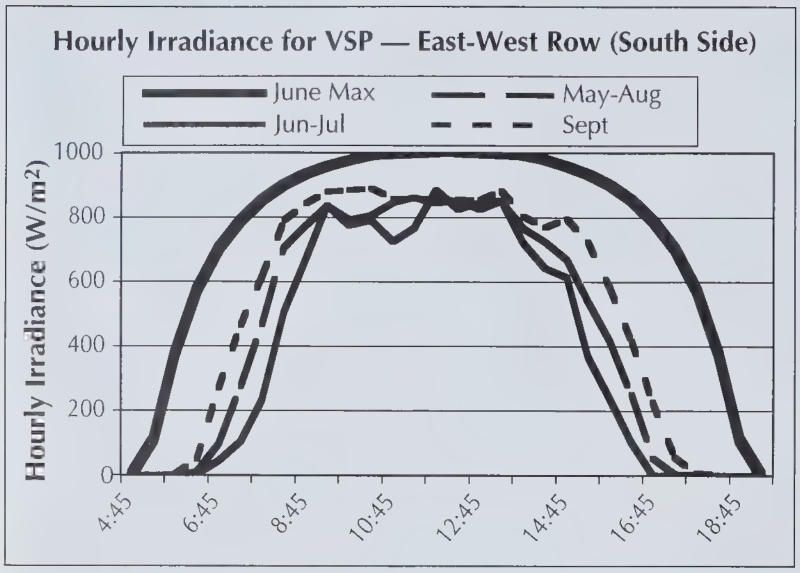


Figure I

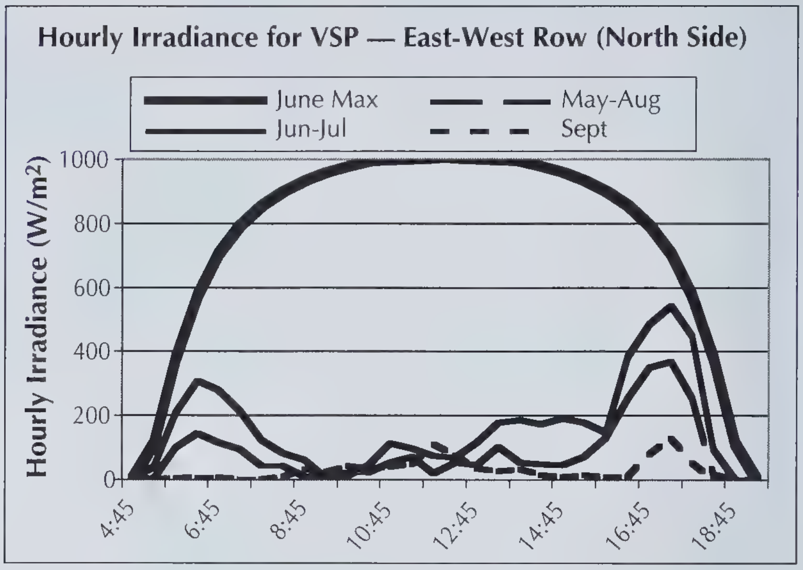
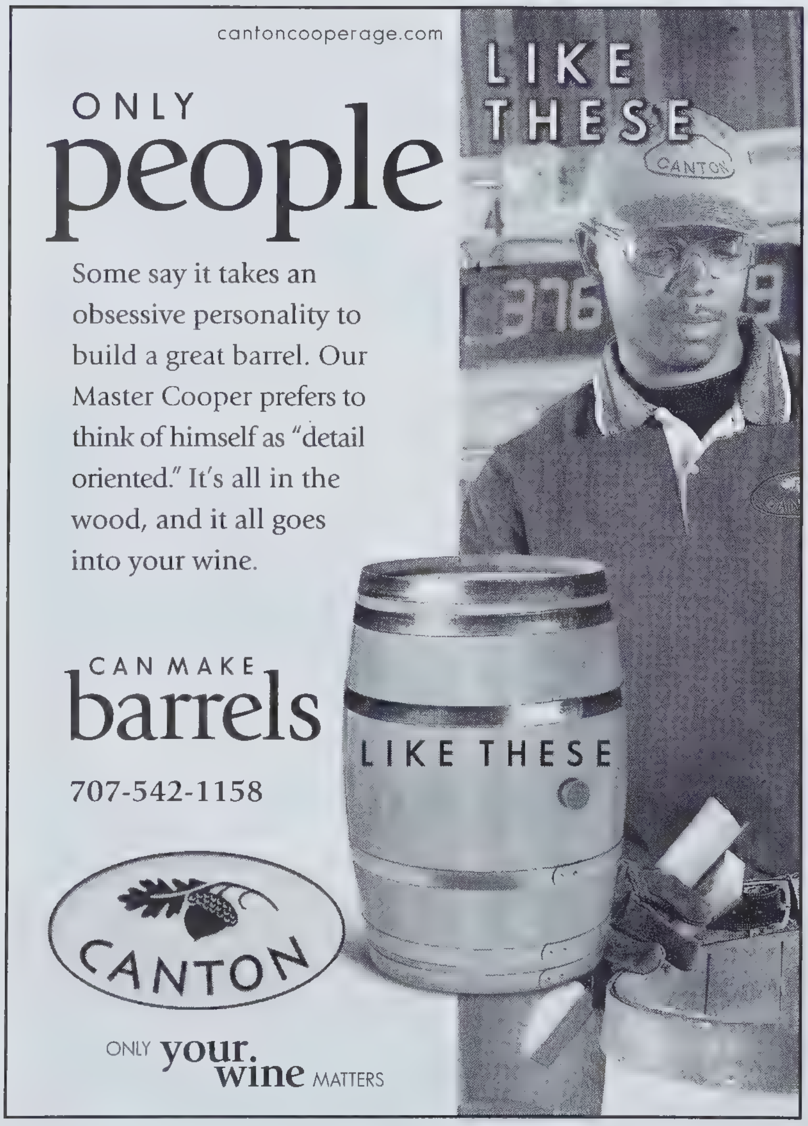


Figure II

vine row near the horizon is clearly seen at the bottom of the image.

The red grid maps the entire yearly sun path for 38° N latitude. The southernmost sun path is December 21, the middle is March 21 and September 21, and the northernmost is June 21. Sun paths are divided into half-hourly segments, and noon is directly south.

Sun paths are symmetrical around the summer and winter solstices — June and July (actually May 21 to June 21 and June 21 to July 21) have the same set of sun paths, as do May/August, April/September. May through September is the growing season analyzed in this article.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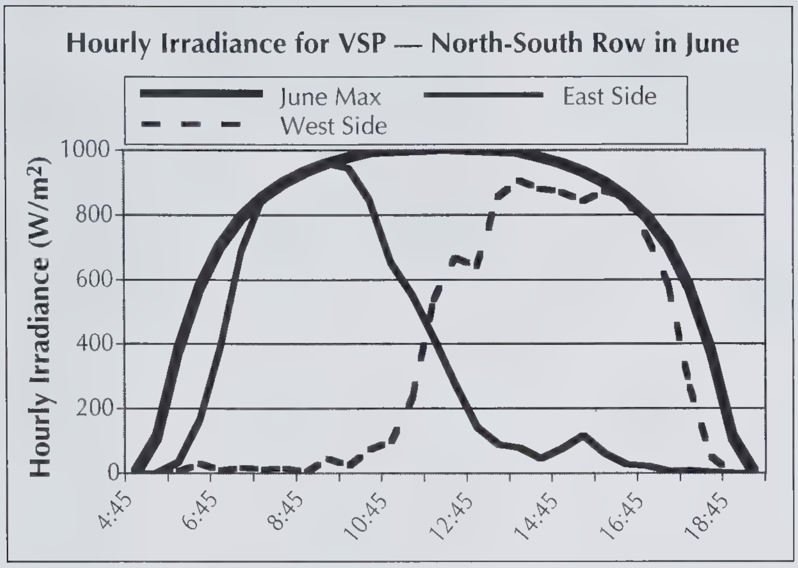

Figure III

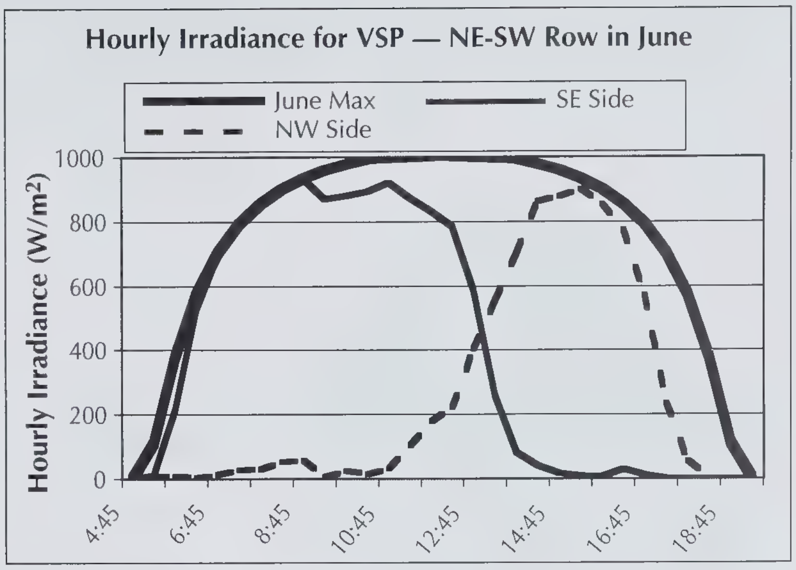

Figure IV

To interpret photo I, view the top three sun paths that traverse the large south-facing opening. Note that June-July sun paths are open for 12 half-hour blocks (from 0900 to 1500 solar time, not daylight savings time). But September sun paths are open for 18 half-hour blocks (from 0730 to about 1730). These are the monthly average exposure periods for south side grapes. Note also that the sun paths do not intercept the adjacent vine row during the growing season; the adjacent vine row provides *no* shade for grapes in this configuration.

VSP in Lodi: east-west rows

A majority of the vineyards in the Lodi American Viticultural Area are

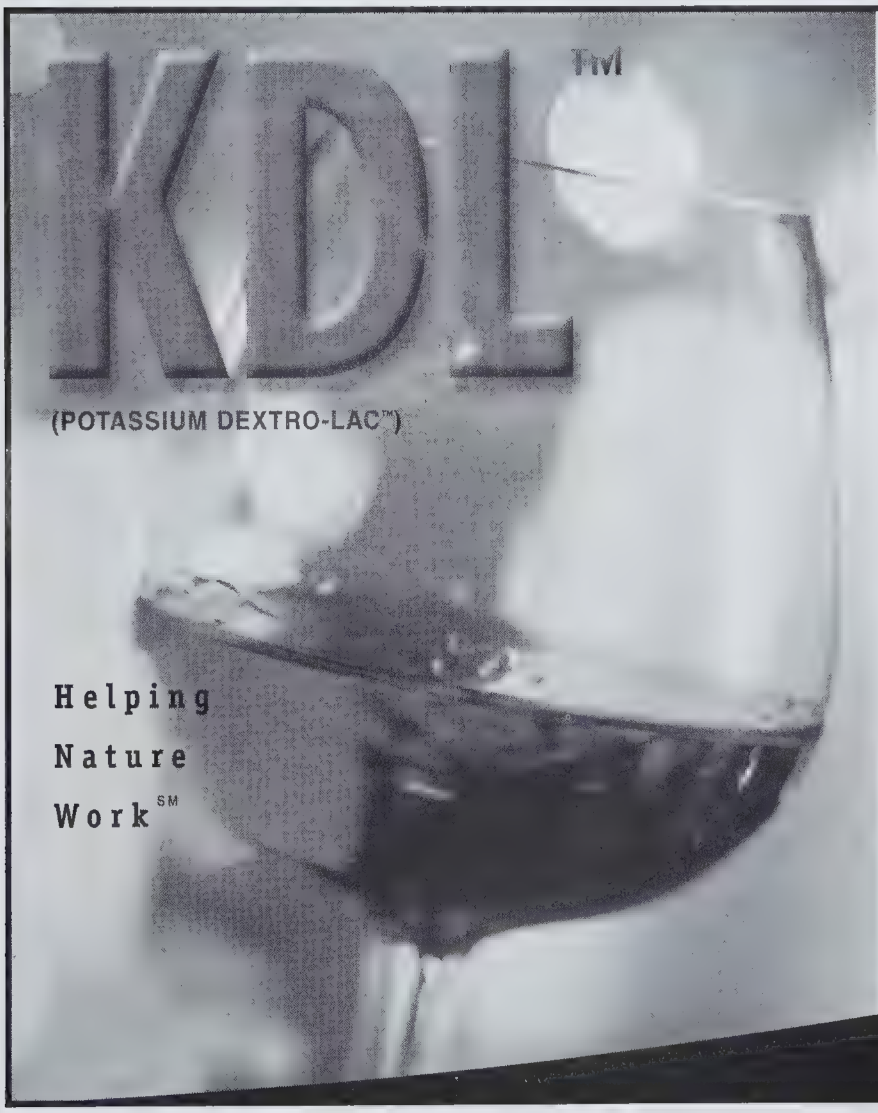

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Table I: Juice Analysis

Treatment	Harvest Date	Yield (tons/a)	Brix	Titratable Acidity (g/l)	pH	Malic Acid (g/l)	Malic Acid (% acidity)
North fruit	9/28	7.0	23.9	4.7	3.59	1.28	27%
South fruit	9/27	7.8	24.6	5.4	3.54	0.90	17%
Composite	9/27	8.7	24.7	6.7	3.39	1.00	15%

Actual yields for the north and south sides have been converted to tons/acre for comparison purposes.

Table II: Wine Analysis

Treatment	Acohol (%v/v)	Tartaric Acid Added (g/l)	Titratable Acidity (g/l)	pH	Volatile Acidity (g/l)	Abs. 280 Phenols	420/530 Hue	420+520 Intensity	Skin Contact (days)
North fruit	11.7	0.6	5.2	3.60	0.42	44	0.67	5.3	30
South fruit	12.7	0.4	5.5	3.64	0.37	48	0.73	5.8	31
Composite	13.1	0.3	5.3	3.71	0.59	50	0.80	7.0	31

planted in east-west rows, and a significant portion have a VSP trellis. The combination of this photographic analysis and a production-scale trial successfully linked specific insolation profiles with wine quality attributes.

First, we will review development of these insolation profiles and then detail the juice and wine composition analysis along with tasting notes from the trial.

Hourly irradiance plots show time of day on the X-axis, and average irradiance on the Y-axis (see Figure I). For reference, each monthly average is represented by a different line style, and the thick black line at the top is the unobstructed maximum for June/July. Maximum potential irradiance at noon in June/July is about 1000 W/m^2 at 38° latitude (think of ten 100-watt light bulbs over a square meter). South side grapes receive a single large peak of irradiance each day in all months. Peak values reach 800 to 900 W/m^2 for many hours, with longer exposure time in September than in June/July (see Photo I).

On the north side, sun paths are blocked by the canopy for most of the growing season, except for short periods at sunrise and sunset (Photo II). The irradiance curve has two peaks in June/July

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By exposing oak to microflora, water, ultra-violet rays and temperature fluctuations, the air seasoning process gently alters its chemical makeup. Seasoning initiates the decomposition of the oak's polymeric structures—cellulose, hemicellulose and lignin—that bind the wood together. The oak has matured to become multi-faceted and layered. At the same time, hydrolysable tannins are reduced, enhancing the wine's texture. The breakdown that occurs during air seasoning prepares the wood for toasting and further flavor development.

Stages of Toasting

Many chemical changes further occur in the wood during toasting to produce positive and desirable results. As 300°F heat is applied, the initial effect is to destroy astringent oak tannins while leaving softer tannins to promote oxidation. As the temperature nears 350°F, the hemicellulose polymer is reduced to simple sugars producing sweet aromas. These sugars caramelize and contribute to the complexity of oak-aged wines. At 400°F wood lignin decomposition yields vanillin as the major flavor component. If held at this temperature for an extended period, the oak breaks down further resulting in smoke aromas. World Cooperage measures and monitors the time the barrel is toasted at each temperature throughout the toasting process.

Using this research, World Cooperage has developed five profiles each with very distinguishable characteristics. The different profiles are achieved by combining specific air-season programs with toasting regimes that include increasing the heat and level of the fire, the duration of time spent on the different fire levels, and the method of applying heat. This research is also applicable to World Cooperage Alternatives.

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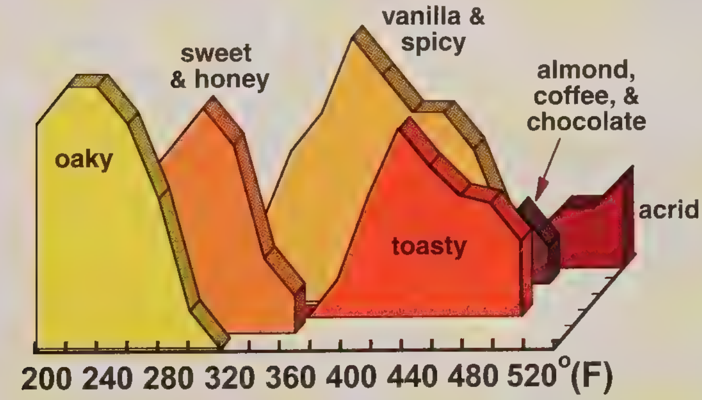

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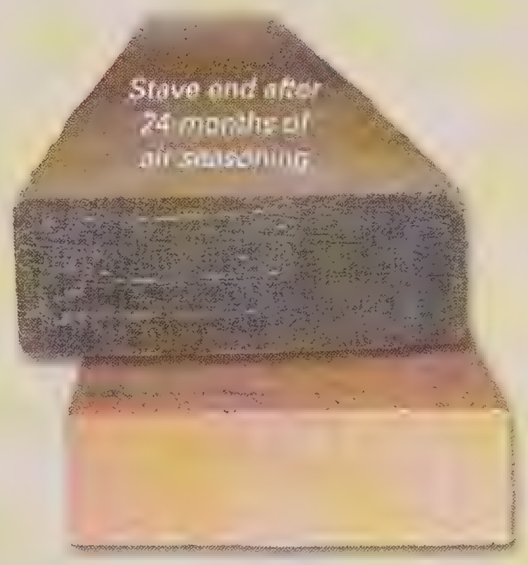

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(300 to 500 W/m^2) at sunrise and sunset, with intermittent sun flecks (up to 200 W/m^2) through the day (Figure II).

Note that direct irradiance at sunrise and sunset disappears in September; the grapes receive little or no direct light at the end of the ripening period. For the entire growing season, north side grapes receive only 24% of the cumulative insolation that south side grapes do. This large insolation differential is the key factor in the wine quality measurements from the parallel field trial.

The Cabernet Sauvignon trial was set up to detail the differences in juice and wine between three treatments:

1) South fruit: This consisted of whatever fruit was facing the south side, picked by hand.

2) North fruit: This was all the north-facing fruit left on the vines after picking the south fruit; also picked by hand.

3) Composite fruit: This was fruit from both sides as normally harvested for the winery, picked mechanically (resulting in slightly higher yields).

The large scale trial consisted of 25 tons of fruit per treatment from a single vineyard (a 7x10 VSP trellis configuration). The nature of the trial was primarily observational without replicates, which tend to conflict with the production scale. Thus, the trial consisted of two contiguous blocks: one block providing grapes from north and south sides, hand-picked as two separate treatments; and the other block providing the composite fruit, with both sides machine-picked together.

At the time of picking, after a few days of severe heat, fruit on the south side was dehydrated and raisined, whereas clusters on the north side showed more intact berries, with just occasional raisining. Picking date seems to require a necessary compromise between two sides, since they develop very differently. All treatments were picked within 48 hours. Tables I and II show the key juice and wine attributes that varied across the treatments.

The south fruit (and the composite) came in at 24.6° Brix, compared to 23.9° Brix for the north fruit. Besides the difference in Brix, we can emphasize the low alcohol of the north fruit (11.7%) compared to the south fruit (13.1%). The color of the composite fruit was more intense by far (A420 + 520 = 7.0) than the north or south fruit individually (A420 + 520 5.3 and 5.8, respectively).

A group of 25 growers and winery staff reviewed the trial results and tasted the wines. Wine from north side fruit was described as thin and unripe (despite the high Brix), with a cherry nose and mouth. Wine from south side fruit had better color, a berry nose, and a raisin/prune note in both nose and mouth. The composite wine was quite similar to south side fruit, but with better color, more texture, and less astringency.

In the blind ranking, north side wine received no first place votes. The group

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was split almost evenly on ranking the composite and south side wines, with a slight preference for the composite wine.

Fruit from neither side made the best wine on its own; it was the composite of both that had the best quantitative results. A different row orientation that would minimize the disparity would be beneficial in homogenizing the fruit, and optimizing the picking decision. What are the risks and opportunities with other row directions for VSP?

VSP simulated in other row directions

Photo III shows the ease of simulating any row direction with the specialized software. This photo demonstrates the same VSP trellis in diagonal row orientation to the northwest and southeast (grape exposure on the southwest side in photo). We simulated three alternative row directions: north-south, diagonal NE-SW, and the other diagonal NW-SE.

A north-south row has east- and west-side fruit and produces a balanced insolation profile for the grapes (Figure III). In June-July, morning irradiance peaks at 800 to 950 W/m^2 on the east side by 1030, followed by a rapid drop in late morning. The afternoon peak on the west-side rises rapidly and maintains high irradiance (800 to 950 W/m^2) from 1300 to 1500 to 1700. Monthly differences, not shown in the graph for reasons of clarity, are primarily near sunrise and sunset.

A diagonal NE-SW row has southeast and northwest sides (Figure IV). The southeast side receives more irradiance than the northwest side. There is an unobstructed morning irradiance peak (800 to 900 W/m^2 for several hours) on the southeast side, and a shorter, lower afternoon peak (600 to 900 W/m^2) on the northwest side.

The other diagonal row NW-SE row has northeast and southwest sides (Figure V). The northeast side receives a morning irradiance peak, with shade by 1100. The southwest side rapidly transitions from shade to full irradiance at 1100, leading to an especially long period of intense afternoon irradiance.

Ripening, heat damage, and sunburn

The ultimate effect of insolation on wine quality is a complex subject, and this research addresses the first stages of converting sunlight into wine — some basic interactions between the VSP trellis structure, row direction, and insolation.

Figure VI shows the cumulative insolation potential over the growing season for the four row orientations analyzed. The highest insolation, at greater than 3500 MJ/m^2, is on the south side and the lowest is on the north side, creating the highest contrast between sides. East and west

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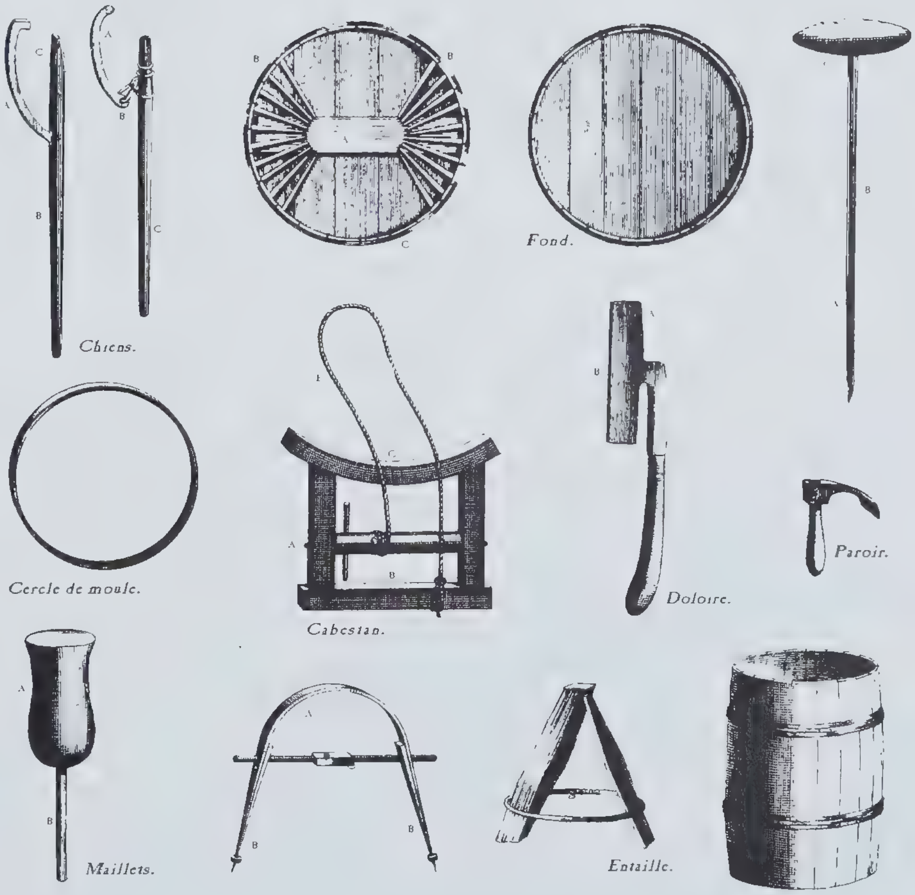

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sides have approximately equal insolation, while the diagonal rows produce a moderate skew towards the south-facing sides.

Heating of berries and clusters

Direct insolation heats berries and clusters, and berry temperatures fluctuate rapidly with irradiance levels.[12] When in direct sun, each berry has a "hot spot" directly facing the sun that receives full normal irradiance. Hot spots move with the sun around each berry and cluster, so no one part of the cluster receives the cumulative insolation value.

Hot spot temperatures are a linear function of irradiance, and maximum skin temperatures on green grape berries can be on the order of 12°C above ambient air. Darker berries absorb more insolation and can be heated even more.

Mid-day temperatures of fully exposed post-veraison Cabernet Sauvignon berries can exceed ambient air by 7°C.[1] Under high air temperatures (above 40°C), this excess can reach 12° to 15°C. Center temperatures of berries are also a linear function of irradiance, and are lower than hot spot temperatures. In tight clusters, heat is rapidly conducted between berries, and the whole cluster may be heated above ambient air, but less than an individual berry.

Heating potential is largely a linear function of irradiance when all other factors, especially wind, are held equal.

Grape ripening

Direct insolation on grape clusters has a multifaceted effect on the ripening process and wine quality.[1,2,3,4,5] In addition to the temperature effects discussed above, secondary compounds that are responsible for aroma and flavor development in the skin are affected by direct insolation.[7]

Generally accepted field observations show that well-exposed, but not over-exposed, bunches of red grapes develop the best color and flavor.[9] Selection of trellis type and row direction has a profound effect on direct insolation, which in turn affects grape ripening and wine quality.

This hemispherical photography analysis takes the first step in quantifying the differences in direct insolation. One of the main challenges to vineyard management is to achieve even ripening. Table III describes the evenness of direct insolation from side to side of a trellis using the ratio of cumulative insolation over the growing period.

A clean VSP trellis in an east-west row has a ratio of direct insolation from south to north of 4:1. This creates a significant potential for differ-

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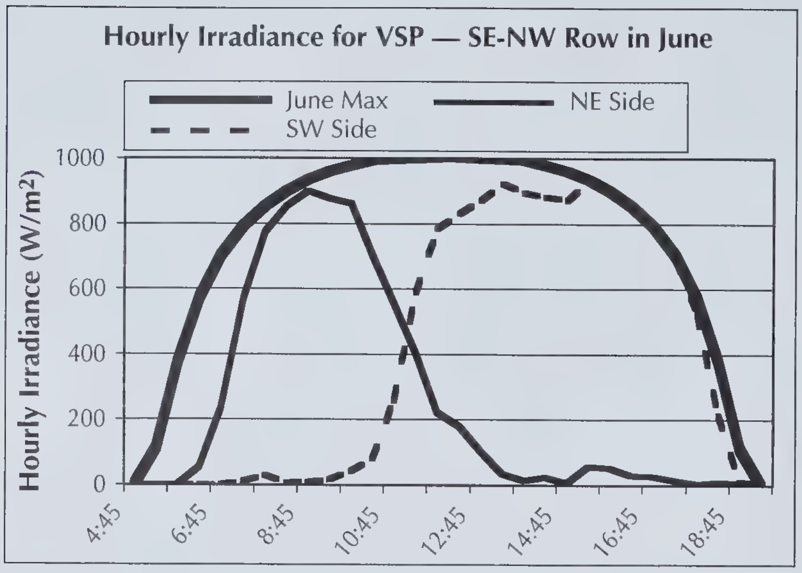


Figure V

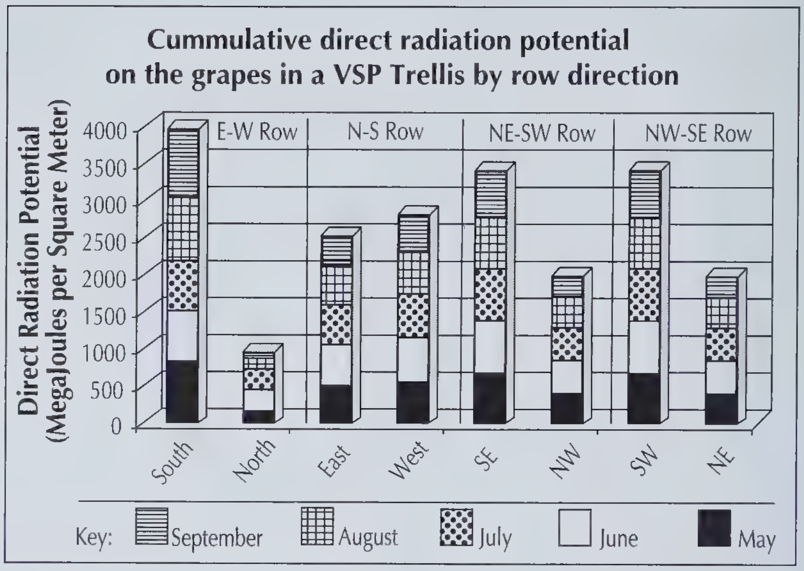


Figure VI

ing levels of sugar and other key compounds during harvest, as demonstrated by the wine trial data. North-south rows have the most even distribution of direct insolation from side to side, but this row direction creates other potential problems such as sunburn (as discussed below).

Heat damage (sunburn)

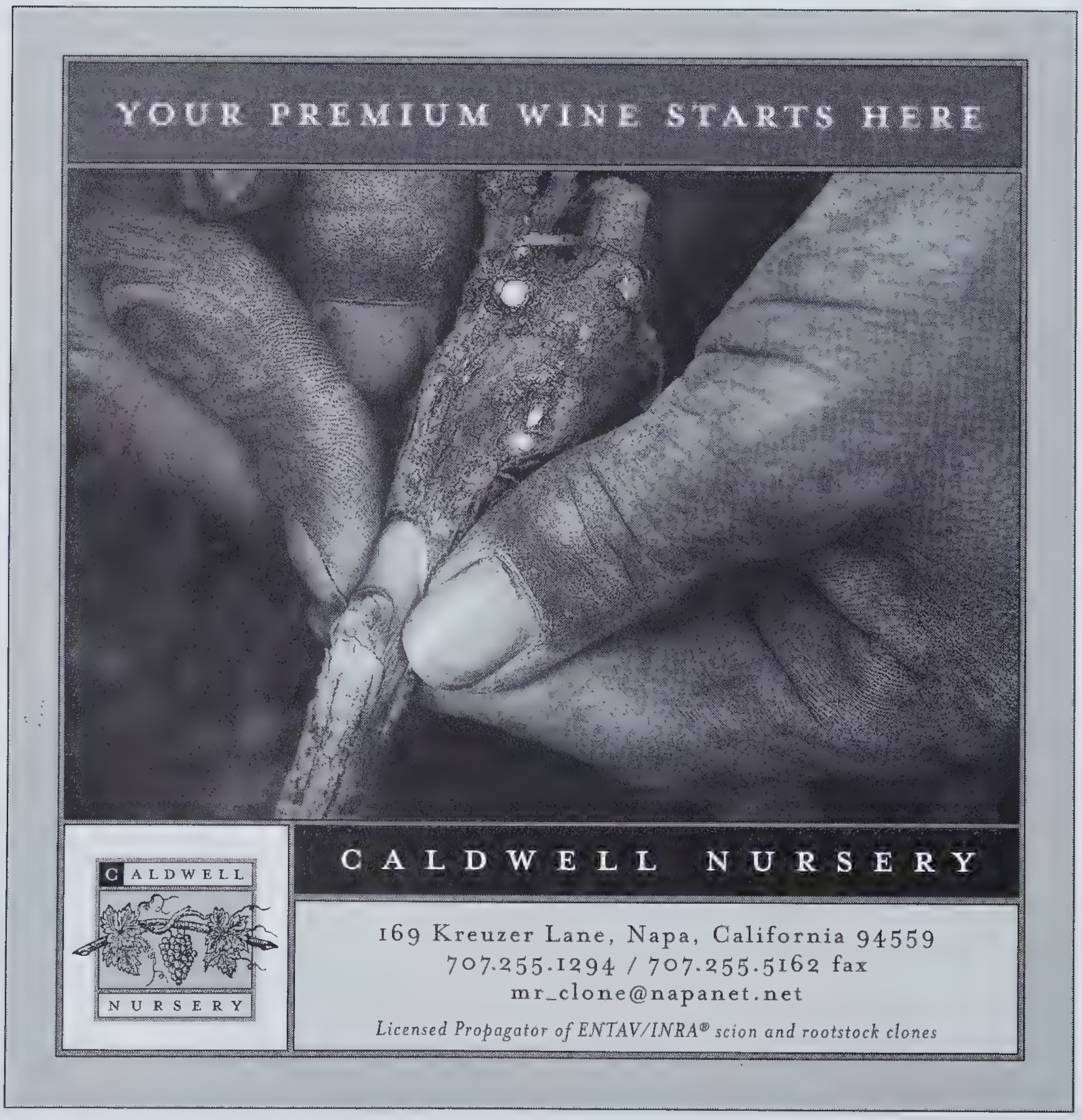
Intense beam radiation combined with high air temperatures can result in "sunburn," which damages grapes to varying degrees. Sunburn can destroy berries outright and/or reduce quality.

In California, where air temperatures can exceed 40°C (105°F); high irradiance can heat hot spots into the high 40s and low 50s (above 115°F). Peak daily air temperatures are typically in mid-afternoon, when potential irradiance is 800 to 950 W/m².

Table III:
VSP Trellis at 38° Latitude

Row Direction	Balance of Insolation (ratio)	Sunburn Risk
East-West	Maximum uneven (4:1)	High (south side)
North-South	Even (1:1)	Very high (west side)
Northeast-Southwest	Somewhat uneven (2:1)	Moderate (NW side)
Northwest-Southeast	Somewhat uneven (2:1)	Extremely high (SW side)

Table III summarizes the balance of insolation and sunburn risk by row direction. Not surprisingly, northwest-southeast rows and north-south rows of a VSP trellis have the highest sunburn risk (southwest side and west side respectively, see Photo III and Figures III and IV). The south side of an east-west row also has a high risk of sunburn in hot climates. The northwest side of a northeast-southwest row also appears to have moderate sunburn potential by this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measure, but peak irradiance is short (see Figure IV).

Conclusions

This project succeeded in clarifying some of the risks and opportunities by row direction for VSP trellis systems in hot climate viticulture.

- For east-west rows, significant differences in insolation (north to south side) produce measurable differences in juice and wine composition.
- Although north side fruit alone produced lower wine quality, the combination in the composite wine produced good results.
- South side fruit showed some signs of sunburn that produced a raisin/prune flavor in the wine.
- Other row directions for VSP have different opportunities and risks:
  * North-south rows provide balanced insolation but have significant sunburn risk on the west side.
  * Northwest-southeast rows have the longest afternoon exposure and therefore, the highest sunburn risk on the southwest side.
  * Northeast-southwest rows are likely to be the best compromise in balance of insolation and sunburn risk reduction for a VSP trellis design in hot climates.

Vineyard canopy analysis with hemispherical photography is a powerful scientific tool that can influence critical vineyard-level decisions focused on improving wine quality. This methodology has been used to evaluate a wide variety of trellis types, to compare insolation profiles between Napa and Oregon, to select row directions for VSP plantings, to design an asymmetrical trellis that reduces sunburn risk, and to quantify the effects of canopy management techniques, including leaf and shoot removal.

Trellis and row direction decisions are long-term capital investments, and hemispherical photography can better evaluate opportunities and liabilities of those decisions in existing and proposed vineyard designs. ■

The Woodbridge Winery appreciates the help with the north/south fruit trial by the Lent-Burden Farming Co.

References continued on page 59

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Pinot Noir plantings have increased in Edna Valley.

Pinot passion

FROM CALIFORNIA'S CENTRAL COAST

BY Eleanor & Ray Heald
Contributing Editors

Pinot Noir passion finds ultimate expression among a few Edna Valley and Arroyo Grande Valley producers. Their dedication to growing and producing Pinot Noir inspired us to invite them to participate in this varietal review, exclusively devoted to these two American Viticultural Areas (AVA) on California's Central Coast.

Distinctive topography and climate mark the eight-mile-long, east-west oriented Edna Valley AVA in San Luis Obispo County. There, the Los Osos Valley channels cool Pacific breezes directly to the mouth of the Edna Valley. Those breezes transport frequent fog and create a mild climate year round, giving the region one of the longest growing seasons in California.

Summer fog and afternoon winds produce a natural cooling system to keep average temperatures below those recorded in the more inland growing regions of the Central Coast. Such climatic conditions are ideal for growing outstanding Pinot Noir.

Eight miles east of the Pacific Ocean in southern San Luis Obispo County, the Arroyo Grande Valley AVA is due south of the Edna Valley and north of Santa Barbara County.

It too runs predominantly east-west and opens directly to the Pacific Ocean, ranking it among the coolest and most temperate viticultural areas in California. Typically, these ideal conditions result in bud break in mid-February, flowering in early May, and harvest in mid-September.

What are planting priorities?

George Donati (Pacific Vineyard Co.) puts site first among vineyard planting priorities, followed by proper clonal selection for the climate within a site.

Terry Speizer (Domaine Alfred) believes these priorities are interdependent. "Over the last 20 years," he says, "we've learned that a combination of factors is required for exceptional Pinot Noir."

Steve Rasmussen (Talley Vineyards) is unsure about an accepted definition for site. He maintains that site encompasses soil, topography, and climate. "Attempting to separate climate and site is impossible," he claims. "Unless you're referencing soil alone, then clonal selection is related."

Steve Dooley (Stephen Ross Wine Cellars) prefers not to distinguish between site and climate. "Site incorporates everything," he contends. "When I first thought about your question, I considered soil, aspect, and climate above and below ground. To me, climate is a general term related to a cool or a warm growing region."

Which has the greater impact on the personality of Pinot Noir?

"Expressed that way," Dooley continues, "I have to agree with George (Donati) and say site — the place where the grapes are grown. For many years, I've been working with fruit from Paragon Vineyards, Edna Ranch, and Domaine Alfred. Although they are all in the Edna Valley AVA, each site expresses a different personality.

"Clones tie into site, and we've all seen an improvement in the quality of Pinot Noir with the newer clones. Yet so many other things, such as new rootstocks and reorientation of row direction to north-south, came along with new clones. It's difficult to isolate the impact of clones alone. Then, there are hillsides in Edna Valley where soils are better suited to Pinot Noir."

Donati explains, "Initially row direction in the Edna Valley was east-west; in the direction of the wind blowing through the valley. The belief was that this orientation allowed wind to move down the rows and rid them of humidity."

Today, row direction is turned more southerly, allowing wind to move over the top of the vines. This north-south direction creates better orientation to sunlight moving across the vine canopy in the afternoon. Viticultural practices, including improved canopy management, mitigate humidity while rows running up and down hillsides avoid the need for terracing.

Problematic afternoon winds are checked not only by improved canopy management but also by casuarinas (Australian pine windbreaks). The trees' fine, lightweight needles discourage birds from nesting. The only negative appears to be that they rob soil moisture when planted too close to vines.

PARTICIPATING PRODUCERS:

John Niven, Owner
Christian Roguenant, Winemaker
Baileyana/Paragon Vineyard Co.
San Luis Obispo, CA

Terry Speizer, Owner
Mike Sinor, Winemaker
Domaine Alfred,
San Luis Obispo, CA

George Donati, Vineyard
Operations Manager
Pacific Vineyard Company,
San Luis Obispo, CA

Stephen Dooley,
Winemaker/Owner
Stephen Ross Wine Cellars,
San Luis Obispo, CA

Steve Rasmussen, Winemaker
Talley Vineyards,
Arroyo Grande, CA

Climate and soil comparisons

Edna Valley, indicates Rasmussen, has slightly more extreme temperature highs and lows than the Arroyo Grande Valley. Bud break is earlier in Arroyo Grande Valley, because winter is warmer overall. Frost there is rare as are temperatures below 32°F, particularly in hillside vineyards, so harvest is also earlier. Arroyo Grande is in a banana belt where younger vines do not always lignify due to fewer days of vine dormancy.

No natural barrier impedes Pacific Ocean breezes from sliding into Arroyo Grande. However, because of the orientation at the mouth of the valley, Arroyo Grande doesn't get the strong prevailing winds, as does Edna Valley, which catches the north-westerly prevailing winds.

In low areas, Donati reports, most of the Edna Valley has heavy clay soils. On hillsides, soils are rockier and better drained with a clay substructure. These are serpentine-type soils with clay formations in the Los Osos, Diablo, and Salinas series. On hillsides, the soil depth is 6 inches to 2 feet (0.15 to 0.61m), whereas in flat, low-lying areas, it may be 3 to 6 feet (0.915m to 1.83m) or deeper.

"On heavy soil sites," Donati explains, "the canopy must be managed differently to control vigor. There's more shoot thinning, more trellis work, such as shoot positioning and adjustable wire movement, which is done best with a vertical shoot-positioned (VSP) trellis."

VSP controls vigor in Pinot Noir because the vine naturally tends to grow downward. VSP forces it upward and aids devigoration. In the most vigorous areas, where there is excessive shoot growth, a split up-and-down (ballerina) canopy is useful.

"In Burgundy," Christian Roguenant (Baileyana) notes, "if Pinot Noir is grown in a flat area in deeper soil, the grapes have better color, less acidity, higher pH, and less-flavorful fruit. On the hillsides, there may be less color but better balanced pH and TA, lower yield, and brighter fruit. We observe the same tendencies in Edna Valley."

Talley has two vineyards in Arroyo Grande Valley: Rincon surrounds the winery and Rosemary Vineyard, approximately one mile away, is closer to the Pacific Ocean.

Clone 2A is planted at both locations, but the wines are dramatically different every year. Some of that, he attributes to climate, which is not radically different. "Most of the differences," Rasmussen concludes, "come from the site and soil combination variation."

Rasmussen finds it difficult to generalize about soil differences between Edna Valley and Arroyo Grande. "Even in flat areas, Arroyo Grande soils tend to be lighter and rockier with a higher pH than Edna Valley. They

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drain better and contain some chalk streaks. There's also some white rock that's not calcium carbonate."

Clones

Clone 5 is a different heat treatment of the Pommard Clone. All participants source some fruit from vines that are one or the other.

Mike Sinor (Domaine Alfred) finds wine produced from only the Pommard Clone uninteresting. It is, however, a complexing agent for the winemaker to add unique nuances, such as animal character. "Growers," he notes, "like Pommard because it's a producer with thicker skins and it's easy to farm. At Domaine Alfred, it's on 5C rootstock and is the earliest maturing."

Domaine Alfred's Chamisal Vineyard was replanted in 1996. The first vintage was 1998. Only now are Sinor and Speizer beginning to develop a history of how various clones perform. Micro-managing clones began in growing season 2002.

Pommard, because of its tendency toward higher yields, is now being pruned differently from Clones 2A, 113, 114, 115, 667, and 777, which are also planted in the Chamisal Vineyard. Pommard is cordon-pruned to one bud; all other clones are pruned to two buds.

"Yet," Dooley (who makes wine from Pommard on 101–14 rootstock planted in 1997) adds, "clonal characteristics are tied to the rootstock, which influences them more than other factors."

Speizer responds: "Given what we knew in 1996 and the choices that were available, we chose SO4 and 5C rootstocks. We knew very little about 101–14 which was just being released." One year later, when Steve (Dooley) planted, much more was known."

According to Donati, "Early on, 101–14 was purported to be a very devigorating rootstock and for that reason we were unsure about whether to use it or not. In Edna Valley soils, as it turns out, it's not that devigorating and actually works quite well."

Wadenswil and Clone 2A are different heat treatments of the same clone. But Dooley maintains that there are also two selections of Clone 2A, with different berry size. "Apparently, the 2A with larger berries was planted in North Coast vineyards. It's not the same as what we have in Edna Valley or Arroyo Grande. Our vines have tighter clusters with smaller berries."

Rasmussen notes that, at Talley in Arroyo Grande, Clone 2A offers good structure, dark fruit character (black cherry), good color, and low pH.

Dooley adds that Pommard and the Dijon clones all have higher pH than Clone 2A, and that fact, among others, offers a good reason to plant a diverse clonal mix.

Roguenant reminds, "Whatever we're saying is based on only four or at

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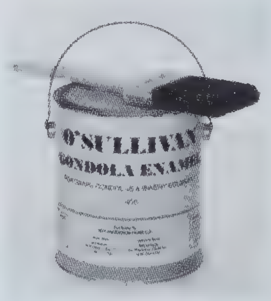

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most five harvests. Clone 667 was the favorite in the 2000 harvest, but in 2001 we didn't like it as much, probably because the yield was somewhat higher.

"Pommard and 777 appear to be the overall best because of higher, delicate flavor levels and velvety texture. Clone 115 is more tannic."

No silver bullet

"Clone 2A is a good clone, but I don't know what to make of it yet," Roguenant continues. "There's a large variation in character, depending on when it's picked. A 10- to 12-day difference in decision when to pick, based on flavors, makes an entirely different wine.

"The Martini Clone is a heavier producer with larger berries. Some of Baileyana's Martini Clone vines are almost 30 years old, so if cropped properly, they offer concentration from the old-vine effect. This clone impacts the body beneficially at 10% to 15% of a blend. However, if we were going to plant more Pinot Noir, we would not plant the Martini Clone. It's good, but there are others that are better now."

Donati explains that, in the early years, Edna Valley Pinot Noir was based on the Martini Clone. "It's growing season-dependent," he remarks, "and inconsistent in the Edna Valley, which does have vintage variation. Therefore, I agree with Christian (Roguenant) that there are now many better clones."

"However," Rasmussen adds, "because Pinot Noir mutates as a varietal, the reality is that the clonal issue needs to be revisited seriously and often."

Speizer assesses Clone 113 as having "simple red fruit without sufficient jazz and pizzazz. But I love Clone 114. It's a good complexing agent and offers flavor elements, depth, and substance that none of the other clones offer. It always makes it into our top-of-the-line Califa label, because it rounds out the mid-palate."

Sinor adds, "Clone 115 struck a chord early on in the Edna and Arroyo Grande Valleys, because when it was released, it did so much better here than the traditional California Martini Clone and Swan selection. People jumped all over it. Yet, I believe the tannic aspect of 115 is too strong.

"There's no silver bullet Pinot Noir clone. A clonal mix is the only way to plant Pinot Noir today."

At Domaine Alfred, Clones 667 and 777 form the base of the winery's two bottlings. Clone 667, with distinct blackberry notes, is the foundation for Califa and Clone 777 for the Domaine bottling. To Speizer, both have stylish characteristics with fruit depth and solid mid-palate.

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Sinor ranks Clone 777 higher hedonistically.

"Often," Dooley notes, "wines with big mouth structure from both of these AVAs have less forward fruit. Conversely, wines with big aromatics don't always exhibit a lot of tannin."

Choices for new plantings

Sinor cautions, "When choosing Pinot Noir clones for a particular site, it's important to base decisions on aromatics but also on intense mid-palate richness, which consumers are demanding of the nouveau Pinot Noirs of the world."

Dooley adds, "Clonal choices for planting now are easy. Look at a neighbor's vineyard. It's obvious that Clone 2A does well here. Clones 667 and 777 also do well. But we still don't know much about rootstocks."

The question, then is how do you choose? Should a vintner match rootstock to clonal selection or rootstock to soil?

"My suggestion," Dooley answers, "to achieve fewer clusters per vine, plant vines as close-spaced as possible. In my case it was slightly under 1,100 vines per acre (VPA) or 2,717 vines per hectare. Next, judge soils and determine whether the site is vigorous or not. Then go for a rootstock match that way."

Desiring low yields on his site, Dooley chose moderate to low vigor rootstocks 101–14 and 3309. Attempting to match rootstock to soil, he now has 12 variations of clone and rootstocks planted on 30 acres.

"I'm in an unusual situation in Edna Valley," Dooley continues. "Soils in my vineyard are well-drained, and I believe vigor can be controlled through irrigation. That's the luxury of well-drained sites in this valley.

"If, however, the soil is heavy clay, it either holds too much water or it dries up into a brick. At locations that are well-drained sandy loam, which is atypical of Edna Valley, growth and vigor can be controlled through irrigation."

Donati notes, "It is possible to manage clay soils with irrigation by planting annual cover crops in alternate tractor rows to reduce excess soil moisture. Planted in winter, cover crops are mowed in spring and remain the entire growing season.

"In the following year, a cover crop is seeded into the alternate tractor rows (not seeded in the previous growing season). The previously planted tractor rows are disked. Soil cultivation prevents soil cracking."

Roguenant prioritizes rootstock choices based on vigor, nematode resistance, and whether or not the clonal selection is early-ripening.

Yield

"At Domaine Alfred," Speizer remarks, "we refer to pounds per vine (PPV) because we have more vines (1,382 VPA) than any other vineyard in the region. Outsiders, however, want to know tons per acre (TPA). We believe it's important to refer to PPV because only 10 years ago, the standard in California was 580 VPA. Also to gather correct data, it's important to discuss yields in PPV."

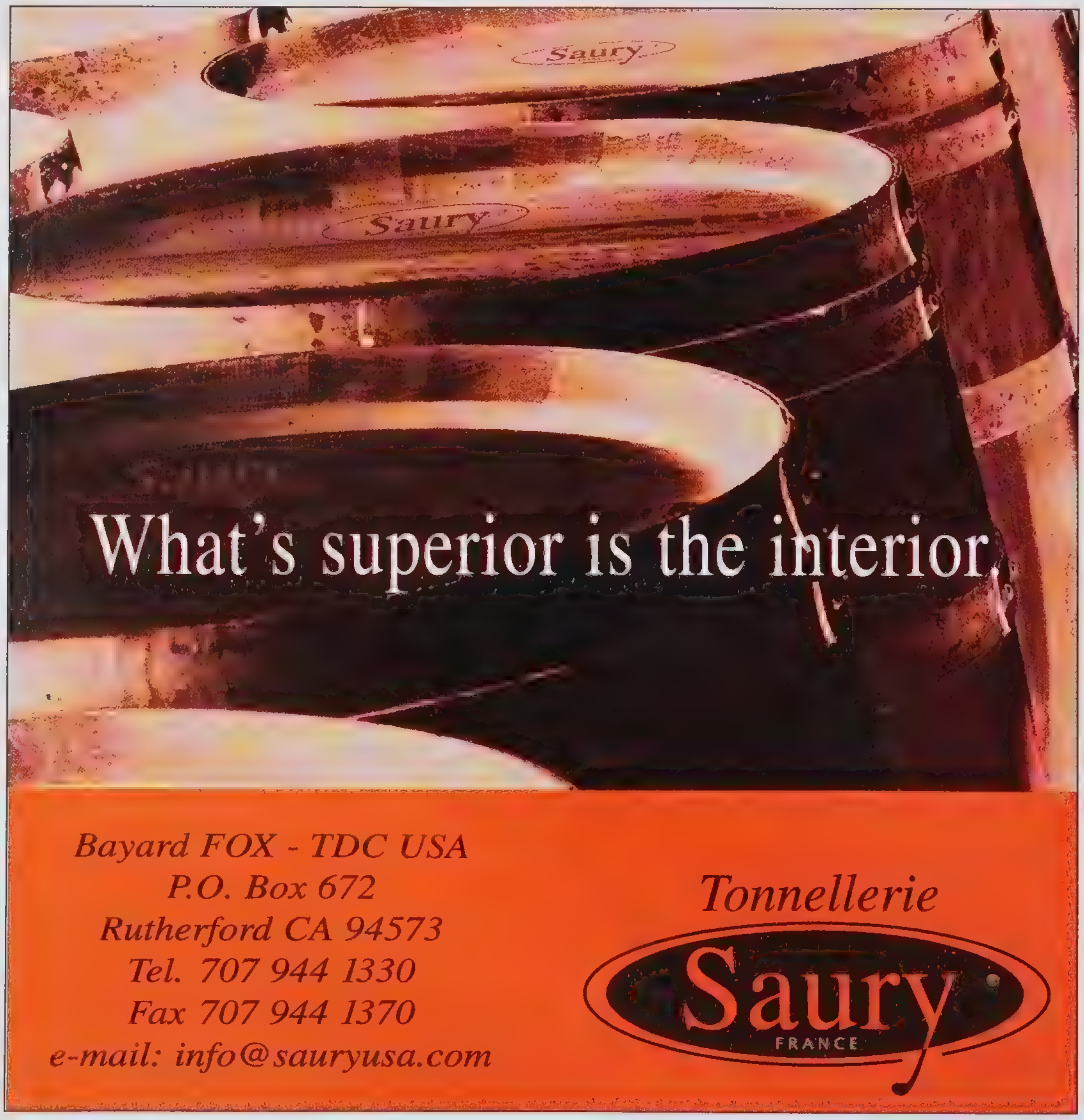
Yet, Dooley counters, "It's better to measure in TPA because if PPV is the standard, it requires vine density qualification."

Donati explains his point of view. At Domaine Alfred's Chamisal Vineyard, each vine has, at most, a 3.5-foot cordon in a dense planting. There will be fewer PPV than if the spacing was wider. "The only correct way," he concludes, "is to discuss VPA in conjunction with TPA. That says it all."

On average, 2 TPA was considered a desirable yield by all participants.

Fruit handling

In the 1980s, Central Coast Pinot Noir producers were more or less conditioned by how North Coast California producers were making Pinot Noir. The norm in the fermentor was 25% whole clusters with crushed fruit on top.



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"That worked fairly well," says Rasmussen, "but we've moved away from that since we're leaning toward a more fruit-driven style, compared to having stem elements in the wine. With a gentle destemmer-crusher, we're now able to get 80% to 90% whole berries through the destemming process. This provides a carbonic maceration effect, capturing some of the high-end volatiles."

Roguenant suggests that the riper the fruit, the more crushing will occur in any destemmer-crusher. The quality of equipment available today has improved. "If destemming is done into a bin, then dumped into the fermentor," he explains, "or if there's a short distance between the crusher and fermentor, it's easy to get 70% to 80% whole berries."

The practical issue for all producers interviewed is that some crushed berries are needed for juice to begin pump-over at the start of fermentation. Early on, all participants do a light punch-down to get some juice in the tank.

Pre-fermentation maceration

For color extraction and to achieve aqueous extraction of those components that would be lost in primary fermentation if it began straightaway, all producers interviewed practice a form of pre-fermentation maceration.

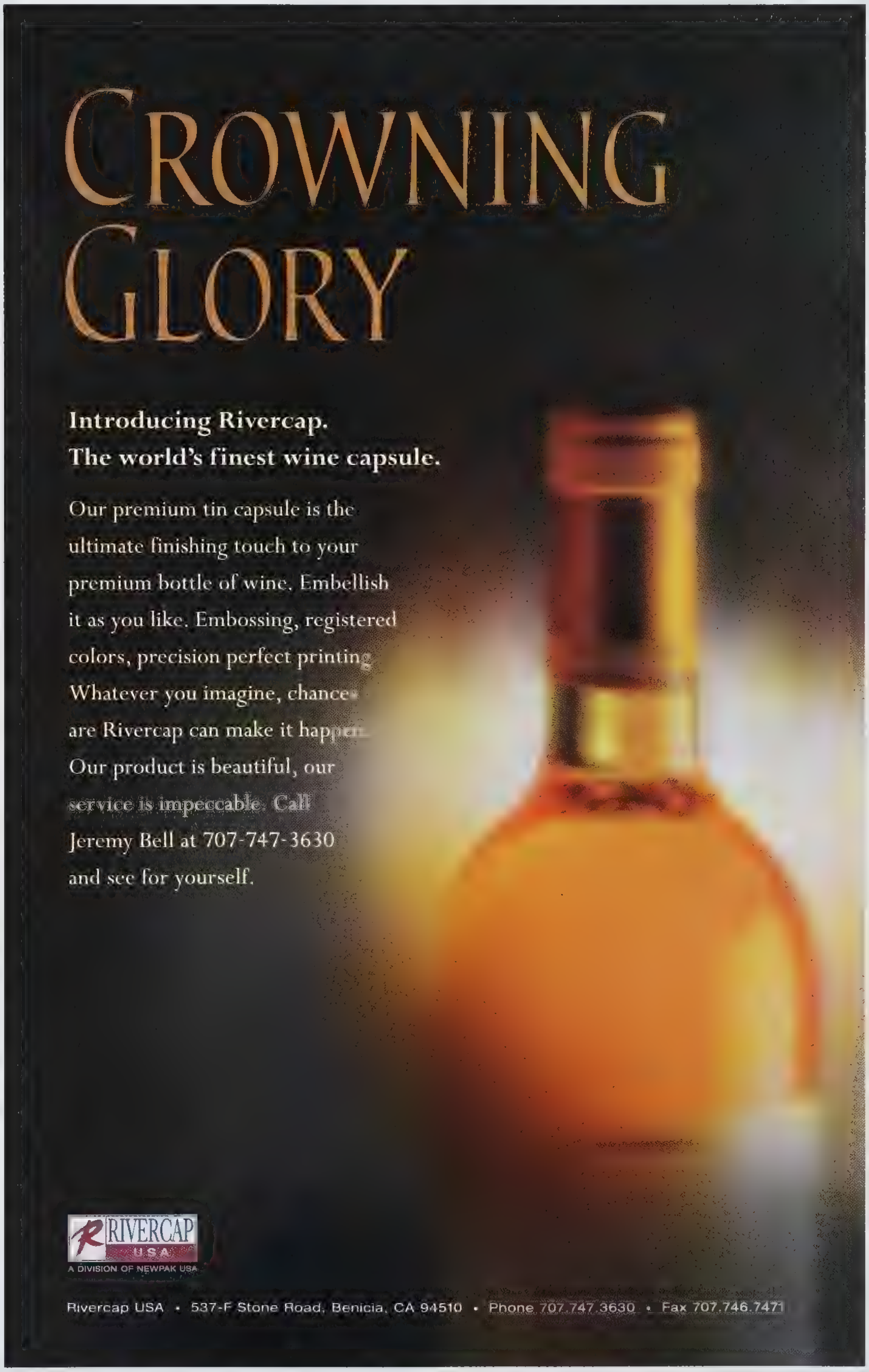
Dooley calls his method "delayed inoculation." On day one, he thoroughly mixes in 30 ppm SO_2 into the must. During the first 48 hours, he looks for a shift in pH from about 3.25 to 3.6. Once that occurs, he adds tartaric acid to reduce the pH to 3.4, so that following malolactic fermentation (MLF), the wine ends up at 3.6 pH. Tartaric acid addition to achieve this, may be as much as 2 to 3 g/L.

Dooley has used calculation methods but considers them too complicated. Since he's worked with the same vineyard blocks for seven years, he believes he has a good idea of the addition to achieve his goal.

Roguenant agrees that pH needs to be corrected in warmer years with a higher yield to achieve a cleaner fermentation. "That way," he maintains, "when the wine ferments, there's less microbiological activity, color and fruit expression are better, and mouthfeel is improved."

Dooley has witnessed very high ethyl acetate and acetic acid levels connected with cold soaks. "That frightens me," he admits. "At 60°F, I'm not saying I accelerate fermentation, but it will be 48 or 72 hours before it either starts or I add yeast culture.

"Cold soak takes place at the temperature the grapes come in — about 60°F, not cold. Attempting to chill must that lacks juice is very difficult. Even if the tank temperature is dialed to 30°F, the temperature does not penetrate a nearly solid mass."



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VARIETAL REVIEW

Pinot Noir
ADVANCES IN NEW ZEALAND

BY Eleanor & Ray Heald, Contributing Editors

Vineyards in Central Otago, at the southern end of New Zealand's South Island compose the most southerly wine region in the world. Although the area is on the edge of sustainable viticulture, some microclimates consistently combine hot days, cool nights, and long dry autumns — perfect for growing Pinot Noir.

Vineyards are nestled into small microclimates, totally surrounded by mountains, many of which are snow-capped year round. Central Otago is New Zealand's only wine region with a continental climate, rather than a maritime one. Along with the risk of frosts, there's the benefit of low rainfall and lengthy sunshine hours.

Of the five distinct microclimates identified in Central Otago, Bannockburn, with its gentle north-facing slopes and deep loess soils appears well-suited to production of more complex Pinot Noir.

With a maximum of only four years of experience using the same clones in New Zealand, Gareth King, viticulturist for Felton Road Wines in Bannockburn, Central Otago, notes that producers are making the same discoveries as those in the Edna Valley and Arroyo Grande Valley.

In Central Otago, growers are attempting to identify the proper clonal mix and rootstocks to plant in microclimates suitable for growing Pinot Noir. "For us, however," King adds, "the first consideration must be climate (soils, wind, temperature, and slope) where we know Pinot Noir can reach physiological maturity.

Clones

King cites Bannockburn plantings of Clones 777, 667, 115, 114,113, clone Am13, DRC Abel, and two different heat treatments of Clone 5. One is referred to as Pommard and the other UCD-5.

"Both Clone 5s," King notes, "have all the variations that Edna Valley and Arroyo Grande Valley vintners encounter with Clone 2A and Wadenswil.

"We also have Clone 10/5 planted. It is similar to descriptors used for Clone 2A in Edna Valley and Arroyo Grande. There's an upright version and another selection, which is jokingly referred to as the "Viagra selection" of Clone 10/5 because of its upward-growing tendency."

Some clonal similarities with Edna Valley and Arroyo Grande exist: Clone 777 is difficult to grow but is not as vigorous as 115 and expresses alcohol that comes across slightly hot. However, it is gaining favor in New Zealand because of its lower vigor.

Clone 5 has good tannin structure. Clone 115 grows upright easily and offers a slightly herbal note but gives the wine good structure.

Clone 667 is quite vigorous yet brings good structure to the wine. "However," King explains, "in three feet of top soil in New Zealand, 667 will be a monster vine due to its vigor."

Rain during harvest is a concern for growing Pinot Noir in New Zealand. Among clones best suited to foil inclement weather patterns are 10/5 and 2A, which are early maturing as are the Dijon clones 777, 667, and 115.

Rootstocks

King chooses 3309 as a workhorse rootstock in shallow soils. For medium to deep soils, the choice is 101–14 and Riparia Gloire. For rockier, well-drained soils, SO4 and 5C. In the young New Zealand soils, there are no problems with nematodes, or excessively high pH (6.5 to 7.5) from calcareous soil.

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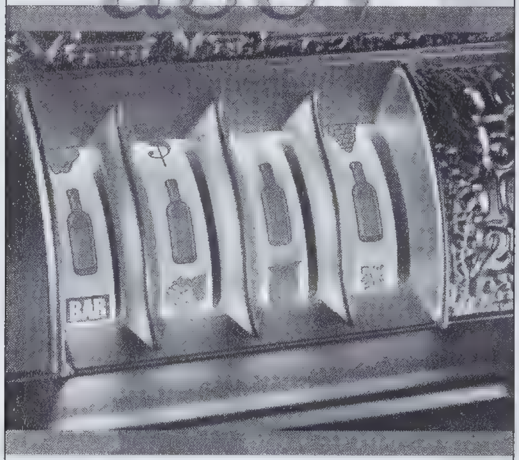

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To chill Pinot Noir whole-berry must faster, Roguenant suggests adding CO_2 pellets. He also uses 28°F glycol in the refrigeration jacket, and when pump-overs are done, he trains workers to run the hose along the side of the tank to chill juice and must quickly. "Even if we bring in fruit a little warmer," he says, "the following day, it will be at 55°F using these methods."

Sinor, who is not working with state-of-the-art technology, gets ultimately practical. "If fruit gets too warm by 10 AM," he reports, "we stop picking."

Roquenant is unconcerned about higher VA derived from a cold soak because most of the acetic acid will metabolize during fermentation. Ethyl acetate is potentially more problematic. "I also believe that pH correction has a lot to do with improving wine quality. In the mid 1980s, we were not doing that well."

Techniques old and new

In 2000, Rasmussen began revisiting fermenting with stems on a small four-barrel lot. One barrel was bottled separately and the other three are part of the 2000 blend. For this experiment, Rasmussen selected the oldest Pinot Noir vines that typically ripen last with low crop yield and have the most-lignified, mature stems.

"We fermented whole clusters in the primitive, Old World way," Rasmussen explains. "It added spicy, clove, and menthol characters in addition to a different wine dimension. Tannins were higher. With greater knowledge today, I believe in retrying some of the techniques we practiced years ago. They didn't work well then but deserve reconsideration in the light of what we know today."

Domaine Alfred has lengthened skin contact time up to 24 days and reports success. The decision to press is made by taste and lab analyses of tannin and pigment levels.

Fluorescent green stems are, however, common in both AVAs, and when they are added to a fermentor, stemmy, green characters are evident. They also contribute potassium ions (K^+), which bump up the pH and lead to tomato and geranium-like wines with high VA.

"In the 1980s," recalls Dooley, "we harvested grapes earlier with greener seeds and we made more astringent wines. Vines had less sun exposure before row direction was changed to north-south. Now that we're picking riper grapes, we get better tannin structure and wines are balanced and rounder."

Rasmussen presses at dryness because experience has shown him that longer time on skins picks up bitterness and astringency that don't resolve and soften with time. "In our situation," he maintains, "we are not looking for more tannin or color, so we

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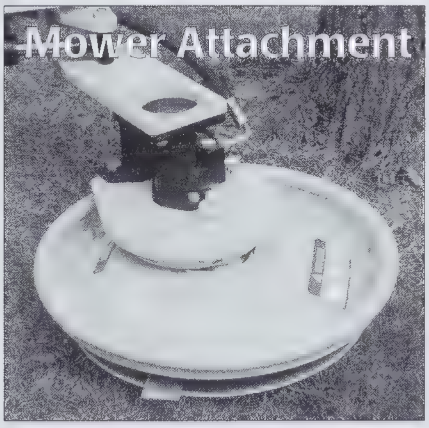

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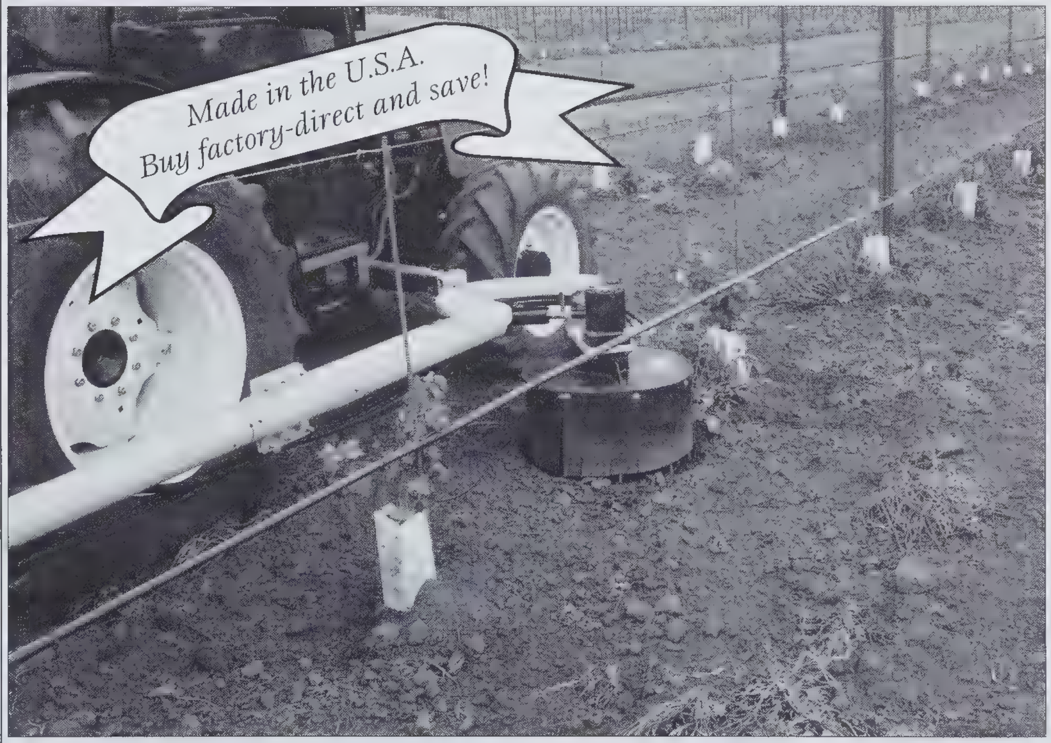

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see no need for a post-fermentation maceration.”

Fermentation temperature

Discussion of fermentation in Sinor’s opinion is difficult because there are so many ways to measure it: cap, wine, inaccurate tank probes, where and when in the tank?

At Domaine Alfred, fermentation is conducted in tanks located outdoors, at the mercy of the weather. Sinor says, however, they hold to one rule — not to exceed 87°F (measured 6 inches under the cap). In former years, winemakers viewed 92°F to 95°F as peaks, but today, interviewed winemakers consider that too hot. It may have been necessary with older clones and less-modern farming techniques.

“With modern viticultural methods,” Sinor adds, “we don’t need hot temperatures for good extraction and at lower peak fermentation temperatures, we preserve fruit characters.”

Since all interviewed winemakers practice punch-down, Roguenant believes it’s worth mentioning that punching down the cap during peak fermentation 5 to 6 times per day is the most efficient way to drop the temperature 5°F or 6°F in a Pinot Noir fermentor.

They also believe that another aspect of temperature is knowing how long the fermentor remains at the peak temperature, because they prefer entering post-fermentation maceration warm. That temperature decreases gradually in five-ton, sealed fermentors. That’s a sufficiently large mass to sustain a gradual cooling, where wine stays relatively warm for 7 to 9 days.

Malolactic fermentation

Because he is not in a hurry to have MLF complete, Rasmussen prefers that it occur in barrel.

Dooley explains the technique he and other participants who conduct

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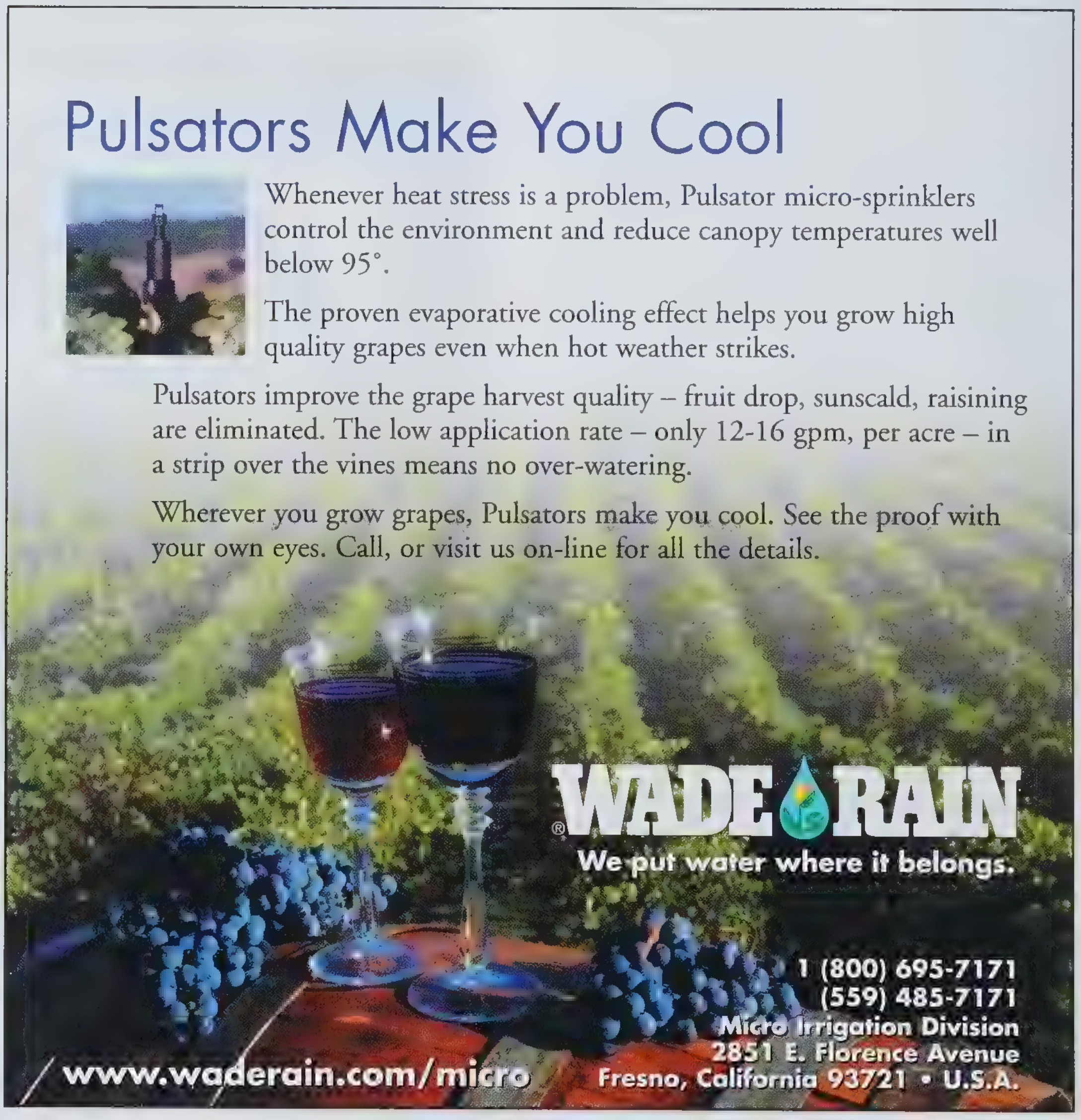

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post-fermentation maceration for Pinot Noir practice. The extended skin-contact time in tank offers the opportunity to discontinue punch-downs the last 3 to 5 days and let the wine settle. The first racking of fairly clear free-run wine is done out of the fermentor. Free-run is settled 24 hours before transfer to barrel to complete MLF.

"By achieving fairly clear wine," Dooley adds, "the wine does not lose tannin or color, as it does when cloudy wine is aged in barrel. Also, Pinot Noir settles quickly."

Other factors, such as how quickly MLF completes are important to Roguenant. At Baileyana, MLF is complete by December. "In Burgundy," he notes, "it probably doesn't start until April of the next year in a 28°F to 36°F cellar.

"Since I do a post-fermentation maceration, I do not use any press fraction wine because, with it, a blend would be too tannic."

Time in barrel

Participants believe that fruit level in a given vintage determines length of barrel ageing. Or as Sinor expresses it, "what the wine warrants."

"Tannins soften with barrel age and that's monitored by taste," says Roguenant. "Now that we're picking Pinot Noir riper, the wine needs less time in barrel; for Baileyana that's about 10 months.

"To preserve maximum fruitiness, the wine is bottled by the next harvest. Because of all the cellar activity during harvest, it's either bottle it in August or the next January. I'd rather bottle early than later to have a wine that's bright and not tired. You can't bring back high-toned fruit once it has disappeared because you've waited too long to bottle."

Dooley expresses different opinions. "As the style of Pinot Noir in the Edna Valley has become bigger, perhaps we can't allow them to age in barrel longer. However, if the goal is to bottle unfiltered, more time in barrel gives the wine more time to clarify. Also, by January and February after the next harvest, winery activities have slowed and it spreads the work load out over the year."

Last drop

Newer plantings with multiple clones and rootstocks, state-of-the-art viticulture, and cellar practices, such as post-fermentation maceration, have allowed producers to connect the dots from soil to bottle and raise the quality bar for Edna Valley and Arroyo Grande Valley Pinot Noir.

Fruit maturity has erased the unripe tomato and geranium character of the regions' former Pinot Noirs. Now, intense, lush flavors of black cherry

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and velvety finishes are the characteristic footprints of the best Pinot Noirs from both Edna Valley and Arroyo Grande Valley. ■

TASTING NOTES

2000 Edna Valley and Arroyo Grande Valley Pinot Noir

Similar to 1997, the hallmark of vintage 2000 for Pinot Noir was very good to outstanding quality with impressive yields in the Edna Valley and Arroyo Grande Valley.

A mild winter with average rainfall launched the growing season with a warm spring and early bud break. Analysis of data over the years 1997 through 2000, also marks vintage 2000 with similarities to 1997, considered a great year.

Where 2000 differs from 1997 is in the hot spells, lasting several days in May, June, and July, which slowed vine development. Continued warm weather in August, through the first two weeks of September, advanced maturity.

At picking, Pinot Noir showed even ripeness, good balance, and color depth, even though yields were above average due to larger berries and cluster weights.

The participating producers tasted each other's 2000 vintage wines in July 2002 and produced the following tasting notes:

2000 Baileyana Pinot Noir, Edna Valley
3,000 cases $22 SRP
Color/Aroma: ruby red; black cherry, earthy, clove, touch of herbaceousness, dried leaves, and as the Burgundians peg it "*sous bois*."
Flavors: dark cherry, brown spices, savory herbs, and mint.
Balance/Finish: medium body; good acid-tannin balance, and soft, round mouthfeel.

2000 Baileyana Firepeak Vineyard Pinot Noir, Edna Valley
1,200 cases $36 SRP
Color/Aroma: deep ruby with purple edges; black cherry with some earthy and herbal notes.
Flavors: rich and ripe black cherry.
Balance/Finish: big wine, full bodied with soft, ripe flavors.

2000 Domaine Alfred Chamisal Vineyard, Edna Valley
2,100 cases $28 SRP
Color/Aroma: deep and dark; dark cherry, cinnamon, clove and assorted brown spices.
Flavors: forward, with amazing concentrated raspberry and dark cherry fruit.
Balance/Finish: wonderfully rich and a good example of concentration in a lush, likeable, and enticing Pinot Noir.

2000 Domaine Alfred Califa, Edna Valley
580 cases $42 SRP
Color/Aroma: very dark ruby; raspberry and blackberry with great spice accents.
Flavors: raspberry and blackberry, full, plump, and layered.
Balance/Finish: full-bodied, lush, sweet middle, and firm tannins. An excellent, concentrated, and fruit-driven Pinot Noir.

2000 Stephen Ross Pinot Noir, Edna Valley
710 cases $28 SRP
Color/Aroma: deep, dark ruby; attractive red fruits with good integration of fruit and spice.
Flavors: big raspberry fruitiness complemented by black cherry.
Balance/Finish: well structured and elegant with good balance of fruit and oak.

2000 Stephen Ross Edna Ranch Pinot Noir, Edna Valley
96 cases $40 SRP
Color/Aroma: light ruby; bright fruit, vanilla over dark cherry and some bacon notes.
Flavors: forward red raspberry fruit, slightly tart with spicy oak.
Balance/Finish: full, extracted, rich, and a sound, balanced wine.

2000 Talley Vineyards Estate Blend Pinot Noir, Arroyo Grande Valley
2,800 cases $30 SRP
Color/Aroma: deep, dark ruby; red berry and black cherry.
Flavors: complex, nice mix of black cherry fruit and spicy oak.
Balance/Finish: well-balanced, excellent body and viscosity, soft, full, and lush with lingering fruit flavors.

PWV *thanks Baileyana for hosting the discussion/tasting.*

Photo on page 28 provided by Domaine Alfred

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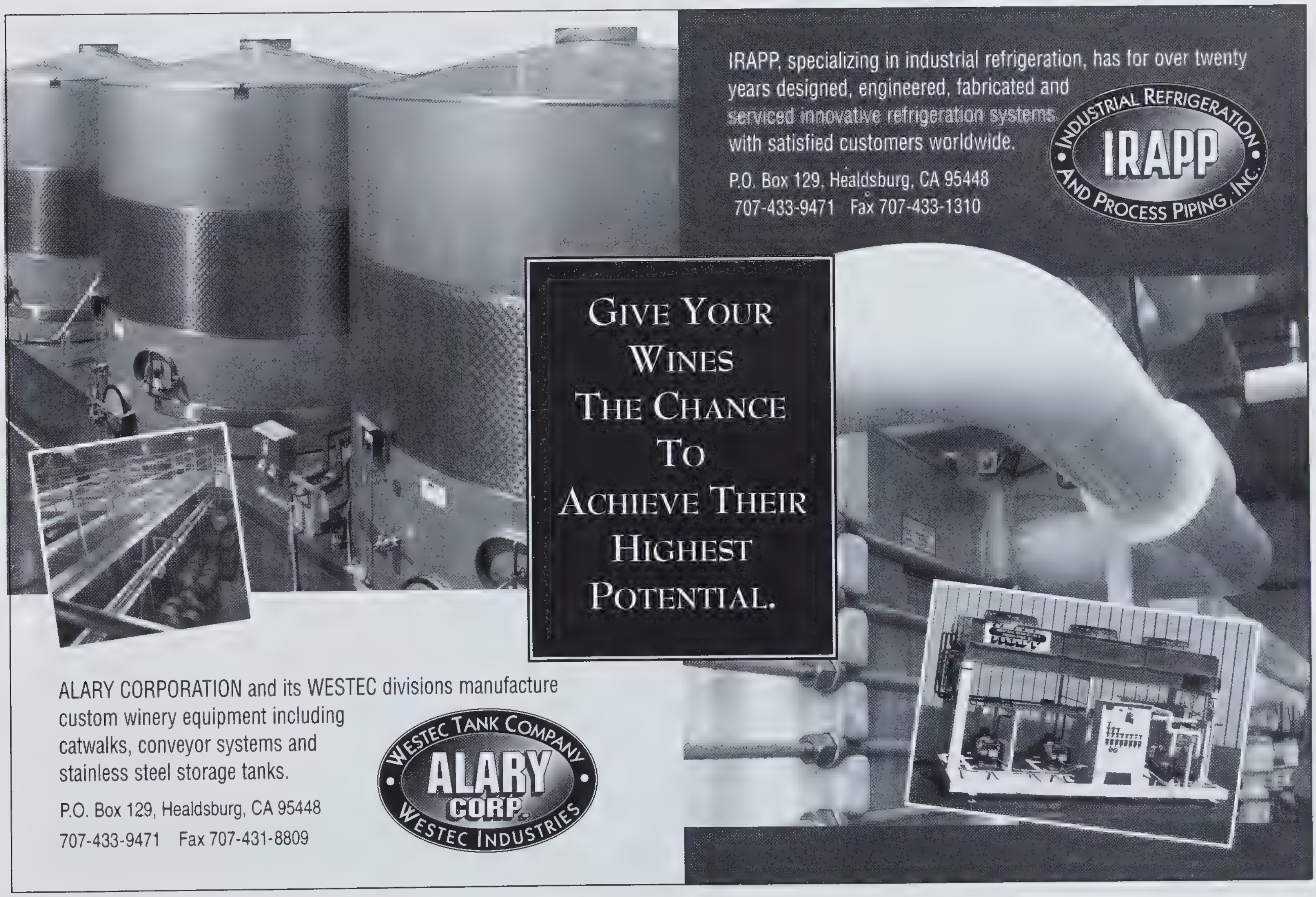

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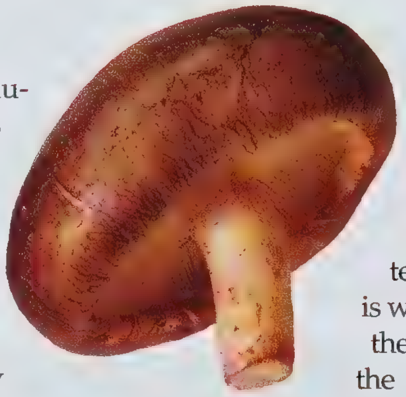
PINOT NOIR

Trickster at the table

BY Mary Evely

Pinot Noir is an elusive grape. Just as it teases winemakers in the vineyard and in the cellar, it refuses to be easily categorized in the kitchen or at the table. Pinot Noir is a red wine, but is completely obliterated by blue cheese. It's a delicate wine, yet pairs perfectly with beef and squab. And if you love Asian cuisines and red wines, Pinot Noir has the best chance of any of being compatible.



Analyze the wine on the palate

To understand how any varietal is going to perform with food, first consider its structure. On the palate, structure and texture are elemental in the success or failure of any pairing.

Like all reds, Pinot Noir has the bitter component of tannin, but the tannins are usually lower and softer. Bitter aspects in wine align with bitter foods and are balanced by fatty foods. The acid tends to be on the high side, a great plus in working with a wider range of foods. Acids, which are tart, balance salty and spicy elements in food. Finally, on the palate, Pinot Noir has great delicacy, and it is easily overwhelmed by strong flavors and heavy textures in food.

Aromas and flavors

Depending on their *terroir,* Pinot Noirs can display two distinct profiles in flavor and aroma. One style has clear berry-cherry flavors with spice and floral notes; the other is an earthy style, with mushrooms, smoke, tea, coffee and/or cola. It is worthwhile to determine the style of Pinot Noir for the best possible result at the table.

Foods for the earthy style

Earthy Pinot Noirs need the most caution when choosing accompanying foods. The very best choices here are foods that display that same earthy quality as the wine. Mushrooms would be at the top of the list, followed by whole-grain starches (pasta and rice) and black-eyed peas. Gamey foods — best are squab, venison and beef — complement the earthy flavors, as does the meaty flavor of rare-cooked ahi tuna. Contrary to common thought, salmon does not work with earthy Pinot Noirs. The fatty fish has a drying and thinning effect on these wines.

Vegetables should be mild in flavor and texture, with preparations that avoid slow-roasting which tends to develop higher sugars. The relatively high acid and low tannins can stand up to salty foods — kalamata olives, for instance, and feta cheese.

Foods for the fruity style

The sweet character of fruit-driven Pinot Noirs creates the more surprising successes in pairing. In addition to working well with all the foods that complement earthy Pinot Noirs, these wines have good fruit and acid, the two textures that can stand up to the mild sweetness and spiciness that are found in many Asian dishes. (Soy sauce, which is salty and has flavors from the fermentation process of its manufacture, helps make the bridge between Asian dishes and Pinot Noir.)

The fruity style can also stand up to more sweetness in vegetables, such as beets, carrots and slow-roasted root vegetables. And it is the fruit in this style that can handle the fattiness of salmon.

In general, sweet fruit should be avoided with any dry wines.

Many mistakes have been made following Pinot Noir aromatics and using berries or cherries in a companion sauce. With skill (or a great deal of taste testing) it can be done, but usually the sugars in the fruit strip the wine of all its fruit character. Pomegranates are one wonderful exception in savory dishes for fruity Pinot Noir. Their very mild and delicate fruit echoes that of the wine, and their sugar and acidity are low enough that they don't interfere with the wine's balance.

The cheese course

There are more pitfalls for Pinot Noir with the cheese course; all our assumptions about red wine and cheese are turned on their heads here. The biggest factor is the delicacy of Pinot Noir. Strong flavors, which define most cheeses, simply overwhelm the wine, as does a fat content that is too high.

The ideal choices are fresh goat cheese, teleme, fresh mozzarella, and at the most extreme, Italian Taleggio. Brie cheeses, which ruin just about every other varietal, can often be wonderful with Pinot Noir, but do a taste-check to make sure. There are no guarantees here, but the earthy Pinot Noir styles tend to fare better with Brie.

Watch the fats

As with high-fat cheeses, delicate Pinot Noir simply can't stand up to rich butter or cream sauces. Even the palate-coating qualities of rich bean stews, such as cassoulet, can get in the way of the wine. The clarity on the palate provided by meat and/or wine reductions is best to showcase this wine.

Methods of preparation

- Grilling, roasting, braising, and quick sautés are the best methods for preparing foods for Pinot Noir.
- Slow-roasting and slow cooking on top of the stove develop too much sugar by caramelizing foods. Red bell peppers served raw or in a quick sauté are wonderful, but when roasted are so sweet that even the fruitiest Pinot Noir becomes thin and dry.
- Stews can be good, as long as they don't include rich or palate-coating ingredients, such as heavy cream, goose or duck fat, or beans.
- Since duck is very high in fat, use only the skinned breast, grilled or pan-seared rare to medium rare.

Summary: Food affinities and conflicts

(Foods marked with an asterisk are for the fruity styles only.)

AFFINITIES

Seafood: salmon*, ahi tuna.

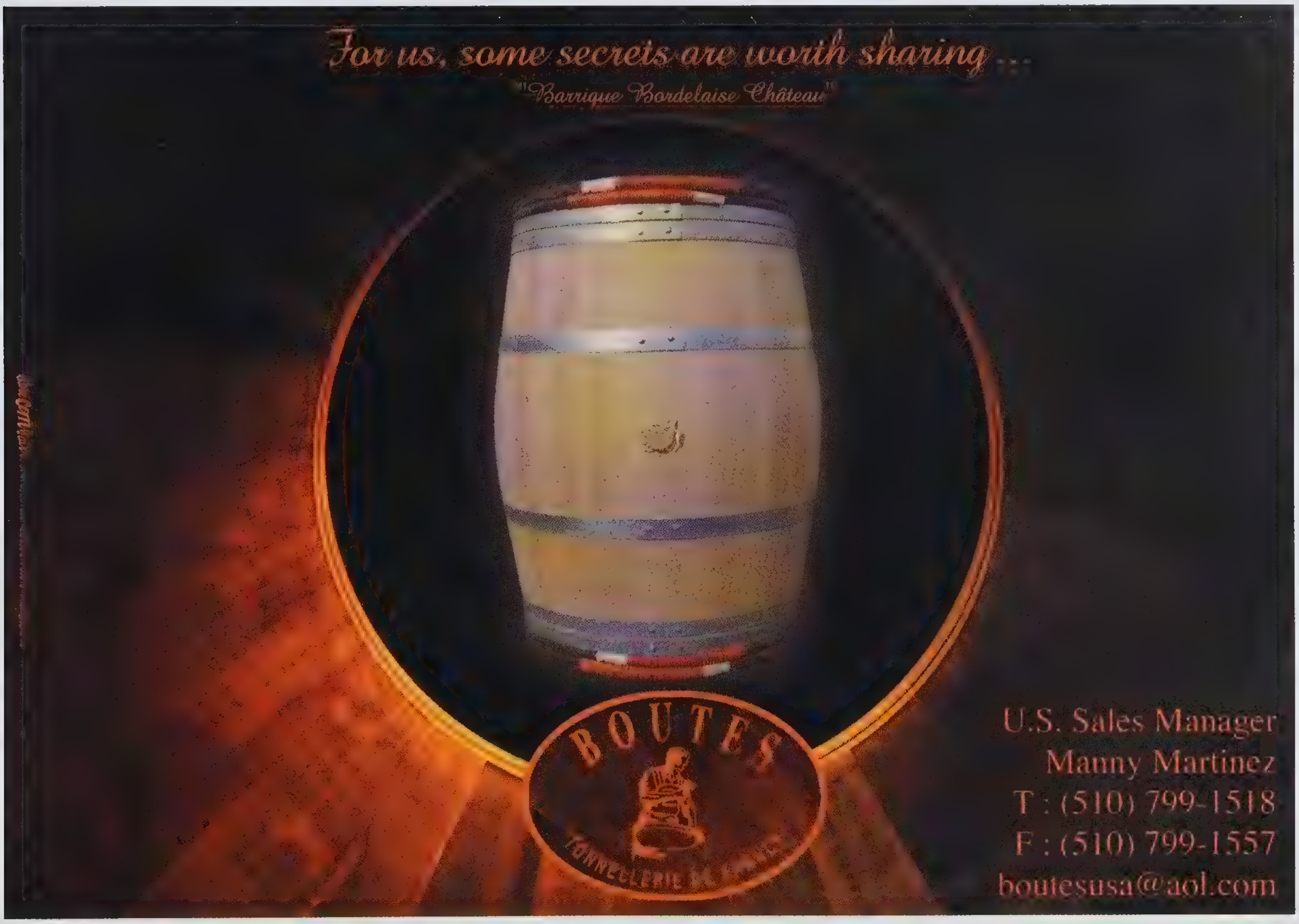
Meat and poultry: beef, pork, duck, squab, venison, game hen, quail, and bacon.

Herbs and spices: mustard, black pepper, clove, lavender, and thyme.

Sauces: meat or poultry reductions, wine reductions, and soy.

Cheese: fresh goat, fresh mozzarella, teleme, taleggio, feta, jack, and brie.

Vegetables and fruits: red beets*, chioggia (red and white striped) and golden beets, chard, kale, mustard greens, carrots*, fennel, potato, celery root, onions, shallots, cabbage, eggplant, mushrooms, red bell pepper, summer squash, pomegranates*,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endive, radicchio, beet greens, and red lettuces.

Grains, legumes, etc: black-eyed peas, lentils, whole-wheat and buckwheat pasta, brown basmati rice, and kalamata olives

Recommended: Dishes with deep but delicate flavor and clarity on the palate.

CONFLICTS

Seafood: oysters, mackerel, smoked fish, and sushi

Meat and poultry: lamb

Herbs and spices: cilantro, cumin, curry, and dill

Sauces: cream, butter, and mayonnaise

Cheese: cheddar, blue, triple-creams, Gouda, and aged goat

Vegetables and fruits: Asparagus, green beans, artichokes, corn, tomatoes, pumpkin, sweet potato, roasted red pepper, and almost all fruit

Grains, legumes, etc: shell beans, and oil-cured olives

Avoid: Strong flavors, such as lamb and blue cheeses; sweetness derived from fruit; sweetness derived from slow-roasted or caramelized vegetables, and high fats.

TASTING NOTES

Wines tasted specifically for this article were: From Edna Valley (fruity style): Baileyana 2000, Domaine Alfred-Califa 2000, Domaine Alfred-Chamisal 2000, and Stephen Ross 2000. From Arroyo Grande (fruity style): Talley 2000 Estate Blend.

From Russian River Valley (earthy style): Hartford Court-Arrendell Vineyard 2000, and Hartford Court-Dutton Ranch-Sanchietti Vineyard 1999

Author of The Vintner's Table Cookbook, *Chef Mary Evely teaches food and wine classes at Santa Rosa Junior College, and UC Davis Extension, and is consulting chef at Hartford Family Winery, Santa Rosa, CA.*

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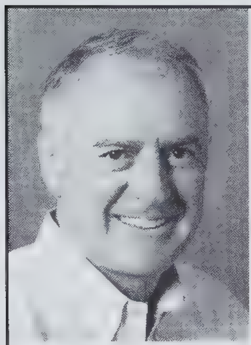

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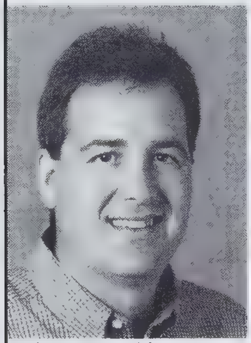
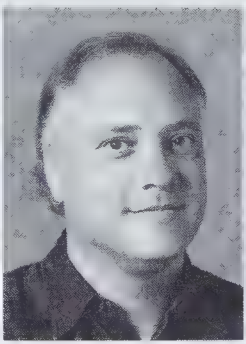


John Ciatti, *California*



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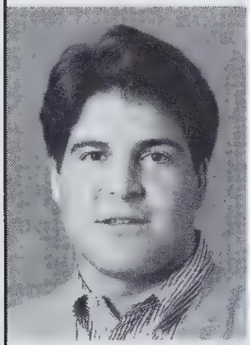
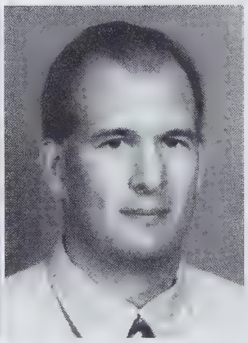


Andy Bivona, *concentrate*

Brad Miller, *concentrate*



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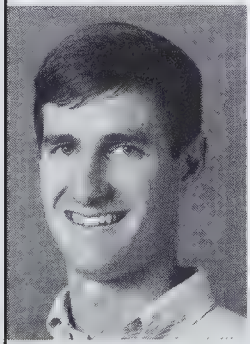

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Strategies to control pocket gophers

Aggressive control measures are necessary to counteract pocket gophers' amazing capacity for destruction of vines and the soil system.

BY Paul Michalczyk
Hawk Hill Vineyard
Sebastopol, CA

Thirty-five species of pocket gophers inhabit the western U.S., and they may be small (six to 10 inches), but they are mighty. Utah State University studies estimate that a single gopher may move over four tons of soil annually. A pocket gopher's burrow system may consist of more than 200 yards of tunnels.

The University of Nebraska has calculated that all of the soil in that entire state is turned over every four years by gophers. Looked at dispassionately, pocket gophers are truly amazing creatures.

It is difficult, however, to look at gophers dispassionately when they are in your vineyard and when, like mine, more than 25% of your newly planted vines have been destroyed in the first year after planting. That is not the worst of it.

Damage caused by erosion in sandy soil hillside vineyards undermined by gopher tunnels can be enormous. Water follows the burrow system, often directing water around rainwater diversions and drains and rendering an expensive, engineered drainage system worthless.

Irrigation water will also follow the burrow system, denying needed moisture to new vines with their small root mass. Even if a gopher doesn't consume a young vine's roots, tunneling can remove the dirt from around the root ball, causing the root system to dry out and die.

Mounds created by burrowing activities are excellent seedbeds for noxious weeds. Mounds can also dull and damage mower blades and create significant dust in the vineyard, leading to increased mite populations.

Damage is not limited to young vines. On my five-acre block of 10-year-old Chardonnay, I annually lose 10 to 15 vines to gophers, which gnaw, girdle, or root-prune one to two-inch diameter trunks. Gophers also significantly damage underground drip systems, PVC pipes, and conduit.

The author's own experience includes loss of 700 vines to pocket gophers in 2001. An assertive control program limited losses to 35 vines in 2002.

Life underground

Clearly controlling gophers is vital to vineyard health, and success requires diligence and perseverence. The first step is to know your enemy. Pocket gophers are well-suited for their life underground. The name "pocket" gopher comes from the rodent's two external fur-lined cheek pouches, one on each side of its head. These pockets are used for carrying food and for removing dirt from their tunnel excavations.

Pocket gophers have excellent vision, despite their small eyes and life underground. Their lips actually close

Author's homemade digging tool is a little smaller than the average tunnel diameter.

behind their teeth, their main tool for digging, so that soil does not get into their mouths. Their forefeet are equipped with long claws, which are used for digging and, along with their chests, are used for moving dirt.

Their whiskers are extraordinarily sensitive to vibration and are a gopher's main means of navigating its burrow system. A gopher's sense of smell is also quite developed, but it is apparently not bothered by human scent. I do not wash or clean my traps, but still enjoy considerable success with trapping.

Except during breeding season, gophers live a solitary life, with only one gopher per burrow system. Most literature states that the maximum is usually 16 to 20 gophers per acre; however, I have trapped more than 600 gophers in a five-acre block over one three-month breeding cycle. Unfortunately, this is by no means a record.

In warmer areas where there is no hard freeze, three annual breeding cycles are common. Four to six "pups" are born in late winter (February–March), early summer (June–July), and fall (October). Sexual maturity occurs at around one year of age.

Gophers can live in virtually any soil type, from very rocky to sandy silt. Of course, they prefer to avoid hard work, and thus, their numbers are greatest in lighter, sandier soils. Their tunnel systems are generally parallel to the surface and 12 to 18 inches deep. The exceptions are their food storage areas, which may be three feet deep, and their nesting areas, which may be as far as five or six feet deep.

In the nesting areas that I have excavated, the access tunnels have come up from below and included side tunnels, possibly for rainwater drainage. (In my area, 50 to 60 inches of rain is not uncommon during the three-month rainy season. So it stands to reason that gophers have devised a way to survive flooding.)

The burrow system consists of the main tunnel with many lateral branches that are used for feeding both above and below ground. Some of these lateral branches reach the

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surface. The most visible ones have large soil mounds left behind as evidence of their tunneling.

However, not all soil mounds have a tunnel underneath. Sometimes, the gophers may travel some distance away from their main exit tunnel to deposit the dirt. The reverse is also true. Even when there are no mounds visible, there may be substantial activity. Frequently, the gopher will take dirt from one tunnel and dispose of it in an abandoned tunnel.

"Feeding holes" are identified by the absence of the dirt mound; they have just a dirt plug which is flush with the surface. These feeding holes can also be identified by the surface vegetation, which is frequently removed in a circular band around the hole. Feeding holes represent the best opportunity for trapping and control. Most holes with large, visible mounds are plugged a short way into the lateral branch tunnels, since they are used primarily to dispose of excess dirt.

Gophers' favorite foods are the roots, stems, and leaves of fleshy plants like dandelions, which experts think are located by smell. Gophers also feed extensively on the green portions of grasses. If these are not available, they will feed on seeds and the woody parts of vines and trees.

Unfortunately, gophers are active at all times of the day and all year around.

Little help from predators

Although gophers are prey to hawks, owls, snakes, badgers, weasels, cats, and coyotes, none of these predators seem to make a dent in their population. My vineyard is called "Hawk Hill" because of the many hawks that inhabit surrounding redwood trees. We also have four owl boxes, which are regularly inhabited by barn owls.

In addition, There are so many cats in my area that there is an annual "Feral Cat Benefit" to raise funds to spay and neuter them. But these creatures don't help much. (Actually, several years ago when there was a huge increase in the feral cat population at my vineyard, there seemed to be an increase in the gopher population as well, perhaps because of a noticeable decrease in snakes and weasels.) All predators go after the easy prey, and as that prey diminishes in numbers, they will leave an area in search of a more abundant food source.

Understanding gophers — how they live and what they eat — can add significantly to your success when trying to eliminate these pesky creatures. For example, baiting with poisonous grain is less effective during periods when gophers are more likely to be feeding on grasses and roots.

The best time to trap is early in the breeding cycle, when the gophers are more active and when their primary food source of fleshy plants is most abundant. It is also important to note that gophers are

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very cautious, given their status as prey to many other species. As such, they act to protect themselves where possible. Keep this in mind when trapping or baiting.

Sure it's a gopher?

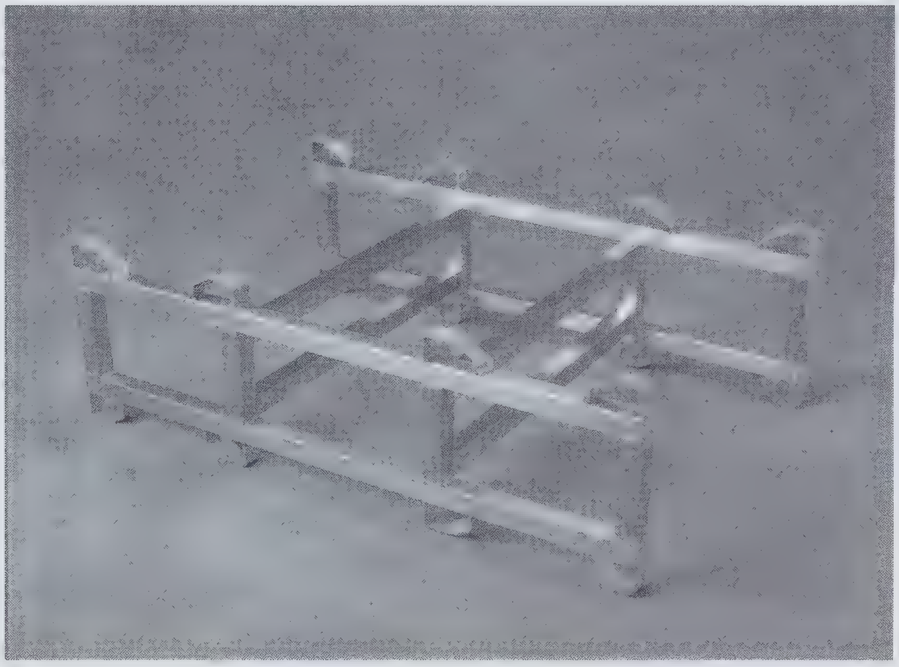
If you have read this far, it's probably because you have a problem. First of all, make sure that your problem is gophers, not moles (which are carnivores and feed on worms and grubs rather than plants), ground squirrels, or prairie dogs. Mole burrows are most commonly confused with gopher burrows.

Gopher mounds are crescent- or horseshoe-shaped. This is because the gopher burrows, being deeper, require the gopher to push to the surface at an angle, expelling the spoils primarily in the direction the gopher exits the access tunnel, thus creating a crescent-shaped mound at the tunnel exit. Mole burrows are shallower and their tunnels exit directly up from below, creating an "eruption" or connical-shaped mound of earth.

Mole burrows have frequent, smaller, conical "eruptions" as the moles burrow through the ground looking for prey. Ground squirrels and prairie dogs have much larger open tunnels, which are not plugged with dirt.

Controlling gophers

The easiest way to deal with a gopher problem is to eliminate their primary food source. Tilling or disking to remove all vegetation (except, of course, the vines) will reduce the incentive for a gopher to remain, and he will depart for literally greener pastures.



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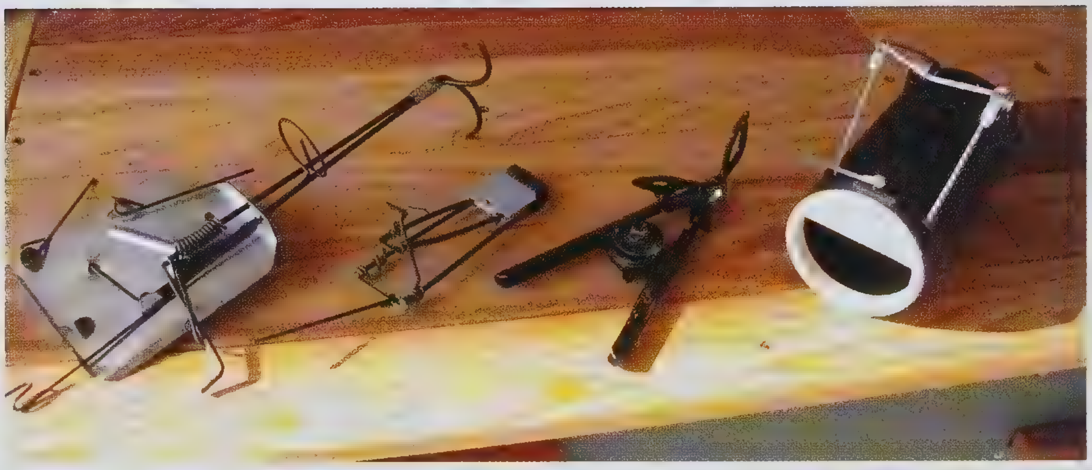


A wide variety of traps are effective, but perseverance is the key to success.

For many growers, however, disking is not an option. The vineyard may be on a hillside or in an area prone to erosion. A cover crop may be desirable to help control plant vigor and dust. Sometimes, the land adjacent to the vineyard will provide enough habitat to make gophers a problem even though the vineyard may be free of typical food sources. In such cases, proactive control is the only solution.

The most common control methods are toxic bait, poison gas (fumigants), and trapping. Recently, a new method using an explosive gas mixture made its debut. This method kills the gopher by concussion. The main words to remember with any of these methods are: diligence and perseverance.

Toxic baits

Toxic baits are usually grains, such as milo or oats, that have been treated with strychnine or other chemicals, such as zinc phosphide or anti-coagulants. (Note that all of the most effective materials are "restricted" and require an applicator license.)

Baits are usually placed into the main tunnel of the system because the lateral branches may be blocked off where they join the main tunnel. Bait is placed in the tunnel by probing the ground with a special bait application tool (a pointed metal rod) which automatically dispenses a metered amount of bait, or by digging into the tunnel with a shovel.

Regardless of the tool, start your search for the main tunnel 12 to 18 inches away from the plug in the tunnel mound. You'll notice that the mound has more dirt on one side. The side with the least dirt is the direction of the main tunnel. When using an automatic bait application tool, the probe will "drop" slightly when the tunnel is located.

After the bait is placed in the main tunnel, you must seal your access with dirt or sod to shut off all light and air currents. Unless this is done, the gopher will probably close off and abandon that portion of the main tunnel. The gopher does not know whether the tunnel has been opened by a predator or an act of nature, but it will take no chances.

Unfortunately, baiting is relatively ineffective when preferred food sources are available. Also, given the gopher's propensity to seal off tunnels that have been disturbed, multiple placements of bait are required to ensure even modest success.

Gophers are also "bait sensitive," refusing bait for many reasons, including possible prior experience with a less-than-lethal dose or simply that they prefer oats while you are using milo.

Finding the main tunnels is difficult and time-consuming. If the ground is rocky or dry, it can be nearly impossible to use a probe, bait dispenser, or even to dig.

Building a better burrow

Several years ago, I used a "burrow building machine." This machine is drawn by a tractor and constructs an artificial burrow into which the gopher hunter drops toxic bait. Gophers find these artificial burrows and actively explore them in an attempt to steal food from a competitor.

These machines can actually work quite well, but they have several drawbacks. To quote from the University of Nebraska website, "The best conditions may be only a day or two after rainfall or irrigation." This is a pretty narrow window, especially if your soil does not permit early tractor access at the end of winter rains.

The other problem I found is that, on my very sandy hillside, the erosion caused by these artificial tunnels was worse than that caused by the gophers. Further, a permanent cover crop severely limits the use of this machine by precluding a clean cut through the soil. Given the right circumstances, however, success rates in the neighborhood of 80% to 90% have been claimed.

Fumigants

I generally avoid fumigants, especially aluminum phosphide. In California, a special endorsement is required to buy it, rendering it unsuitable for use by employees without substantial training and liability. Further, it is usually available only by special order.

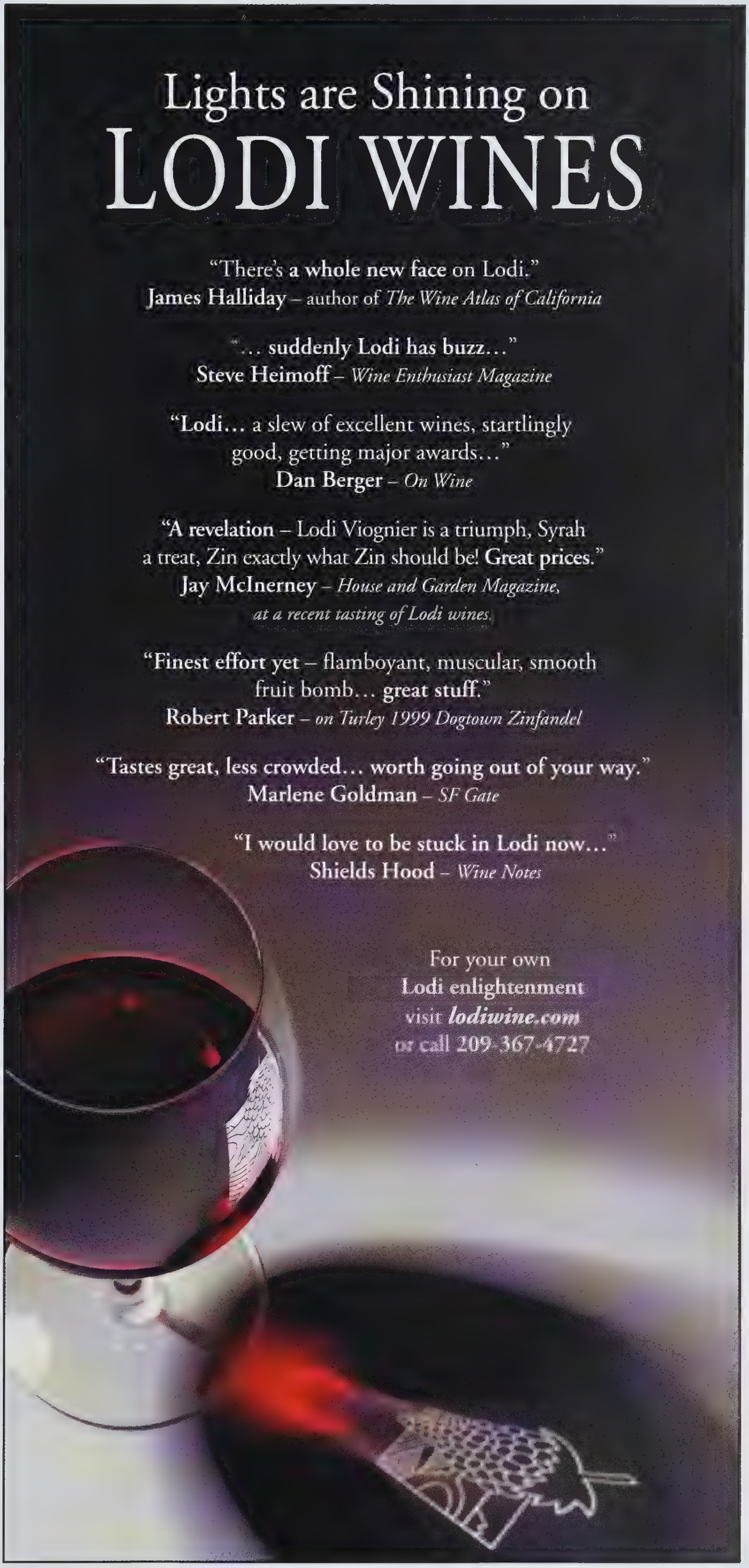
Other growers who do use fumigants tell me there is a specific time window for application. The ground must be wet enough to cause the material to become gaseous and to prevent the gas from dissipating through the tunnel walls. A large volume of gas is needed to flood the tunnel system, but too much is wasteful.

Road flares, diesel soaked rags, and flammable tablets purchased over the counter at nursery and home improvement stores have not been found to be effective.

Challenges of trapping

I have had the best luck with trapping but have found that most of the trapping instructions were written by people who have never tried to trap large numbers of gophers in less than optimal conditions.

Commonly, instructions call for discovery of the main tunnel by probing and digging just like baiting. The user must then dig a very large hole, 12 to 18 inches in diameter, to expose the main tunnel and set the trap of your choice in both directions. The hole then must be covered by a board and sealed to prevent light and air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currents from entering, to keep the gopher from closing off that portion of the tunnel.

When setting a trap in a lateral exit tunnel using this method, you must enlarge the tunnel to accept the trap without getting so much dirt into the main tunnel that it is blocked off. Again, the lateral tunnel must be covered over, or the gopher will simply push dirt into the lateral branch and block it.

Most of these traps require the gopher to blunder into the trigger mechanism to activate it. It is difficult to see if the trap has been "sprung," and when the ground is dry and hard, it is extremely difficult to dig the large hole required.

I believe a much better system is to use a "clinch" type trap that has about a four- to six-inch space between the jaws of the trap and the trigger. Find a feeding hole, one that has a very small (if any) mound, a dirt plug that is level with or slightly below ground level, and where the grass around the hole may be closely cropped. This is an active tunnel that you can be sure has not been blocked off.

I use a regular large screwdriver to probe the dirt plug. If it is to a feeding hole, the screwdriver will go right through. Carefully remove the dirt plug, which should only be an inch or so deep. Partially open the jaws of the trap and insert it into the tunnel as far as you can easily. Finish opening the jaws and fully set the trap. *Do not* cover or close off the hole.

The reason for not closing the hole is that whenever a gopher's tunnel system has been disturbed, its immediate reaction is to push dirt into the disturbed areas to block it off. This is to prevent predators, such as snakes or weasels, from entering the tunnel system.

However, the gopher knows that this tunnel provides access to a food source and therefore it will try to block the tunnel at its opening, rather than where it joins the main tunnel. Because of the relatively large gap between the trigger and the jaws, the gopher enters the area of the jaws as he pushes dirt ahead. When this dirt hits the trap's trigger, it activates the trap. If the gap is too small, the trap will simply be buried or sprung without capturing the gopher.

I made a small tool to facilitate removing the dirt plug by welding a piece of scrap metal onto a pry bar purchased at a local home supply center. It is shaped like a long screwdriver with a bent tip. The scrap metal piece is a little less than two inches across to fit easily inside gopher tunnels, which are between two and three inches in diameter.

I have made similar tools for neighbors by using a large washer of the proper diameter. It is a very simple matter to use this tool to "scoop" dirt from the tunnel opening. No digging is involved, which speeds the process, especially since there are no holes to backfill.

It takes about three hours to go through my 13 total acres of grapevines

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and set 30 to 40 traps. Often, I will hear the traps spring when I'm in an adjacent row. If the traps are still empty after 24 hours, it means that tunnel system has been abandoned, so I remove them to a new location. I usually get at least one gopher for every three traps set. (My personal best is 32 gophers with 40 traps in one day.)

Since you are not digging or probing the soil looking for the main tunnel, it doesn't matter how dry, rocky, or hard the soil is. The gopher is doing the work for you by digging up from underneath. If your vineyard is too large to cover in three hours or so, divide it into manageable sections.

Disposing of up to 30 dead gophers per day can be a challenge, but you can seal the carcasses in "zip lock" plastic bags and put them in a trash receptacle for removal. Do not bury them where they may be dug up by family cats and dogs or other predators.

Diligence and persistence

Since diligence and persistence are so important, I try to go out for three or four consecutive mornings about every two weeks. Mornings are best, since it is easy to see any new activity — newly expelled earth is typically a darker color than the dryer surroundings. Usually by midmorning, everything has dried out to a uniform color.

Be sure to knock down any gopher mounds that you see. This way, the new mounds are easy to spot the next day. Usually, where you find the new mounds, you will find the all-important feeding holes nearby.

It is extremely important to trap on a regular basis. Just like mildew and other vineyard pests, once they're established, gophers can be extremely difficult to eradicate.

Gophers are ever-present in the environment and will freely migrate into your vineyard from the surrounding property.

You must have a schedule and stick to it if you are to gain the upper hand. Trapping gophers is time-consuming, but so is waiting for a replacement vine to bear fruit.

Here are some excellent web sites that may be helpful:

- University of Nebraska, Lincoln — www.inar.unl.edu/pubs/wildlife/g1290
- University of California — www.ipm.ucdavis.edu (Publication 7433)
- Colorado State University — www.ext.colostate.edu/pubs/natres/06515
- Utah State University — www.extension.usu.edu/publica/natrpubs/gopher.pdf

The above references provide additional information, such as suppliers of toxicants, application devices and materials, and traps. The Utah State University web site also provides plans for building a burrow builder, if you feel really ambitious. ■

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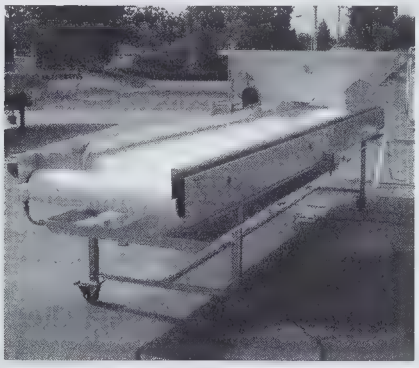

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A "motherline" of boulders is intended to reflect Ravenswood's individuality and wit. One rock from the quarry has a blasting hole leading directly to the winery logo molded into the concrete wall.

RAVENSWOOD QUARRY SITE

Winemaking ON THE ROCKS

**BY Deirdre Booth,
Steve Martin, P.E.,
Summit Engineering Inc.,
Santa Rosa, CA**

Known for its slogan "No Wimpy Wines," Ravenswood Vineyards (Sonoma CA), chose a "No Wimpy Site" when planning for its new winery. The site is an active rock quarry in the Carneros region of Sonoma County. In 1996, planning began for a 250,000 case per year production facility that would operate concurrently with the quarry.

Unique to the overall design and development of the property was the planning for a marriage between the quarry operations and winery activities. Key elements of this marriage included coordination of winery vehicles and quarry truck circulation, common use of the existing truck scale, mutual water supply, dust control with reclaimed winery wastewater, quarry noise levels, and public safety.

Reclaiming the land

Ravenswood's chosen site had been an active quarry since the 1800s. However, the quarry was nearing the end of its life, with the majority of its operations slated to end in 2002. At the end of its life, a quarry must be left in a safe, stable condition for public safety and environmental sensitivity.

While it would seem an unnatural fit to develop a portion of a quarry property as a winery, Justin Faggioli, former Ravenswood vice president, visualized a sustainable use for the property. His plan called for recovering the land in a manner that was congruent with Sonoma County's General Plan and would incorporate a building site into the final Quarry Reclamation Plan.

(A Quarry Reclamation Plan is the document, including both construction drawings and narrative, that is prepared for specifying the final configuration of a former quarry site. This document is required by both state and county regulations.)

Planning of the building site involved taking advantage of the reclaimed topography to situate the building with natural landscaping and a lake view (created by filling the gaping hole with water).

"The quarry offered a great location for us due to its already established truck access routes and its proximity to our pre-existing facility outside Sonoma that serves as our central base, as well as offering us a chance to improve on a landscape that had literally been eaten away," explains Joel Peterson, winemaker and president of Ravenswood.

Solid concepts

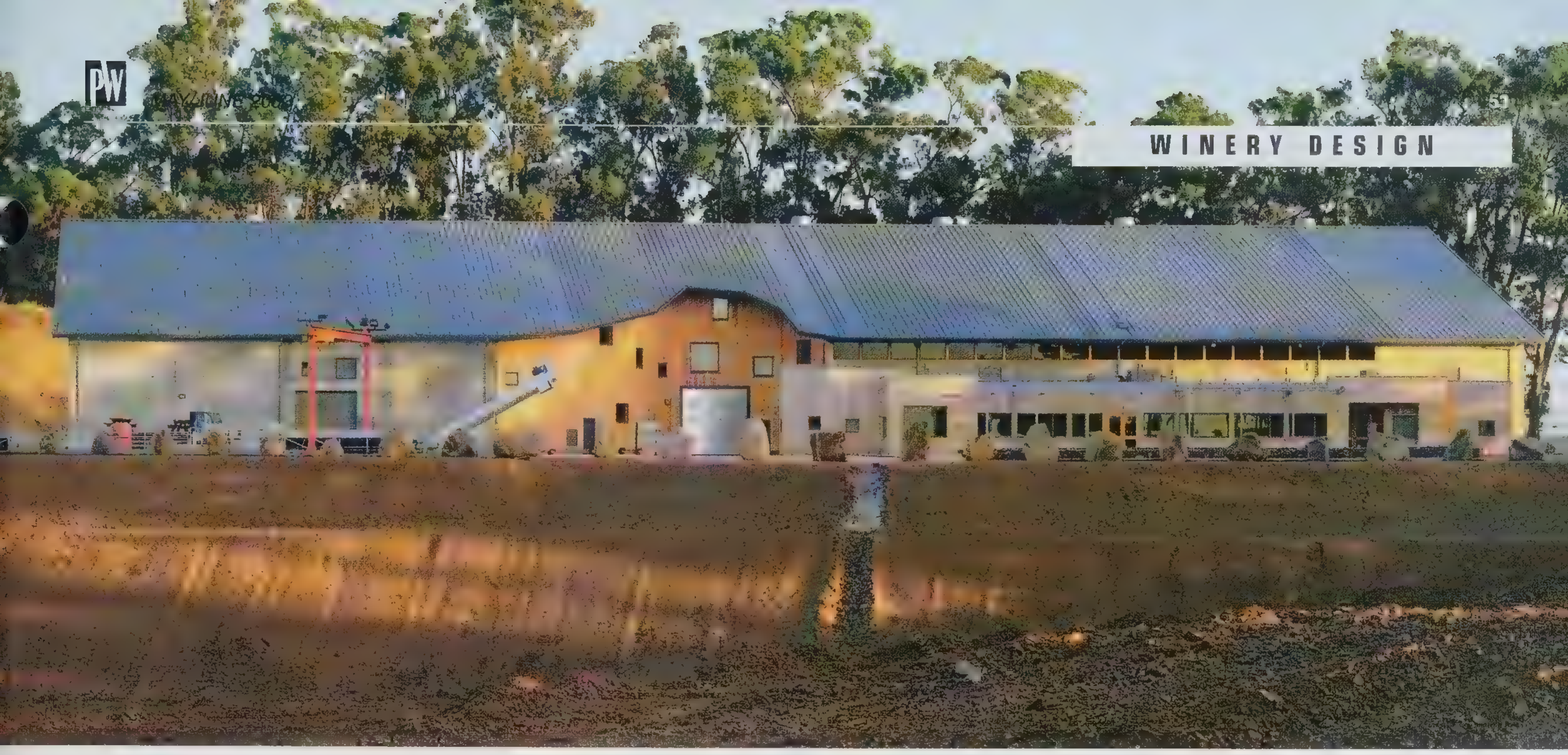
Faggioli went to Steve Martin, P.E., vice president of Summit Engineering Inc., with his vision for a quarry winery in 1996. Martin, Faggioli and their respective teams brainstormed the winery concept and began master planning the facility.

Utilizing Summit Engineering's proprietary winery program development documents and planning process, requirements for the winery were developed. This process started with the Summit Engineering 20-page questionnaire that queries the winery team in extensive detail on their winemaking — from grape receiving through processing to finished case goods being trucked off-site.

Upon completion of the requirements, Summit Engineering proceeded with master planning and development of the concept facility plans. Siting of the winery building took into account standard considerations for building areas, accessory structures, earthwork, traffic circulation, parking, fire protection, storage, and other infrastructure components. Equally important was the aforementioned view of the lake and of Mount Diablo in the distance.

Ravenswood's high performance in the wine industry demanded a high performance production winery. The winery was master-planned as a two-phase project. Phase I included a 52,000-square-foot main production area, 3,500-square-foot administration/office module, and related infrastructure improvements.

Phase II included a 27,000-square-foot addition to the production facility for barrel storage. The phased approach



Looking north at the winery from the future lake, one can see the unusual "bite" out of the structure, the motherline of rocks bordering the site, and the crush/receiving area in front of the building.

was timed to match Ravenswood's business plan milestones and to support its economic goals.

Comprehensive master planning of the phased winery development was crucial since it was the basis for the project description and corresponding use requested within the discretionary Use Permit. A comprehensive project description and corresponding use statement helps to ensure that the client is subject to the county and public review process only one time.

Permitting

The Use Permit application for Ravenswood's Quarry Winery was submitted in May, 1996. This was the first time in Sonoma County that a quarry site was proposed to be reclaimed for a winery development.

After the initial and collective "Huh?...you're proposing what?" from planning staff, they began to see positive aspects of the plan and its potential benefits to Sonoma County. Nonetheless, they did have legitimate concerns relating to the proposed project that they addressed in the application processing and at public hearings.

Main concerns focused around compatibility of the joint uses and site safety for winery employees, quarry workers, and the general public. Safety concerns centered on traffic at the highway entrance, internal winery and quarry traffic, quarry blasting operations, air quality, and geological stability.

In addition, it was necessary to request a zoning change on the portion of the property that the winery site encompassed. The MR (Mineral Reserve) zoning designation was lifted to allow for an agricultural processing facility — a winery.

RAVENS
WOOD

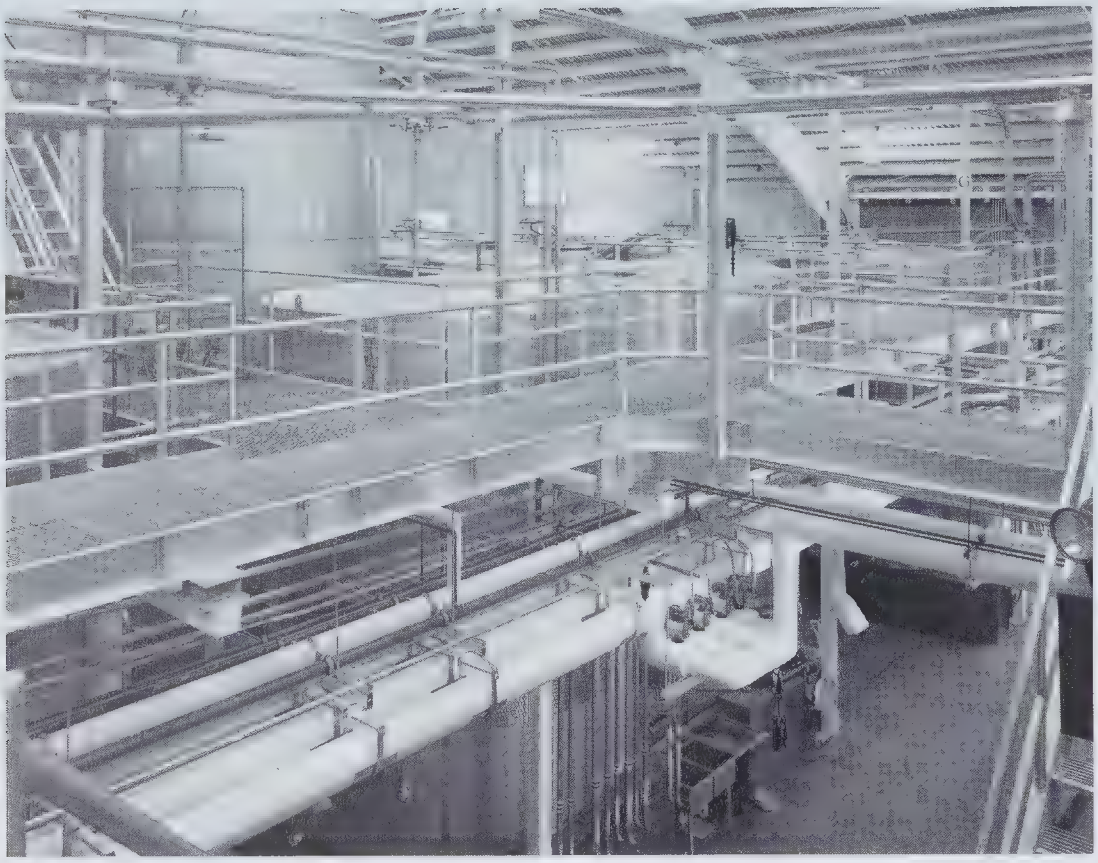
The Use Permit application was reviewed and processed in a timely manner by planning staff, and was unanimously approved by the Sonoma County Board of Zoning Adjustments and Board of Supervisors in early 1997.

Not only was there no public opposition to the application, but both supervisors and commissioners expressed positive declarations on the application. They indicated that the project was unique in siting and design, while proving that quarry reclamation can be accomplished in a manner that is aesthetically pleasing and economically beneficial to the county.

Designing for success

Prior to approval of the Use Permit by Sonoma County, Ravenswood decided to move forward with the design. Designing concurrent with the Use Permit process was risky, but necessary because of timing considerations. Ravenswood was committed to processing fruit at this facility in the 1999 harvest — dictating a construction completion of August 1999. Summit moved forward as the design team leader, coordinating and working closely with the selected design consultants, and managing the design project.

Architectural concept design was by Ross Anderson of Anderson Architects of New York, and the project architect was Rich MacRae (Sebastopol, CA). Mechanical engineering was done by Larkin Associates (Sebastopol, CA), electrical engineering by Zak Zakalik of Meyer's Engineering (now with Summit's Suite16 Electrical Engineering), landscape architecture by Julie Bargemann of D.I.R.T. Studio (Charlottesville, VA), and civil, struc-



Ravenswood's 8-foot wide mezzanine catwalks between tanks are a winemaker's dream, allowing unconstrained working access to top of tanks.

tural, and wastewater design by Summit Engineering.

"Design of the winery was a true team collaboration, says Anderson. "Summit's experience in winery processing was invaluable to the design. Justin Faggioli's knowledge and appreciation of the site, combined with Julie Bargemann's landscaping talent, gave us the right team to carry out the design."

A tough exterior

The building exterior was designed to respond to the texture of the site and the site's position on a sensitive view corridor. The idea was to maximize the size to accommodate Ravenswood's current and future needs while visually minimizing its impact on the winery's surroundings.

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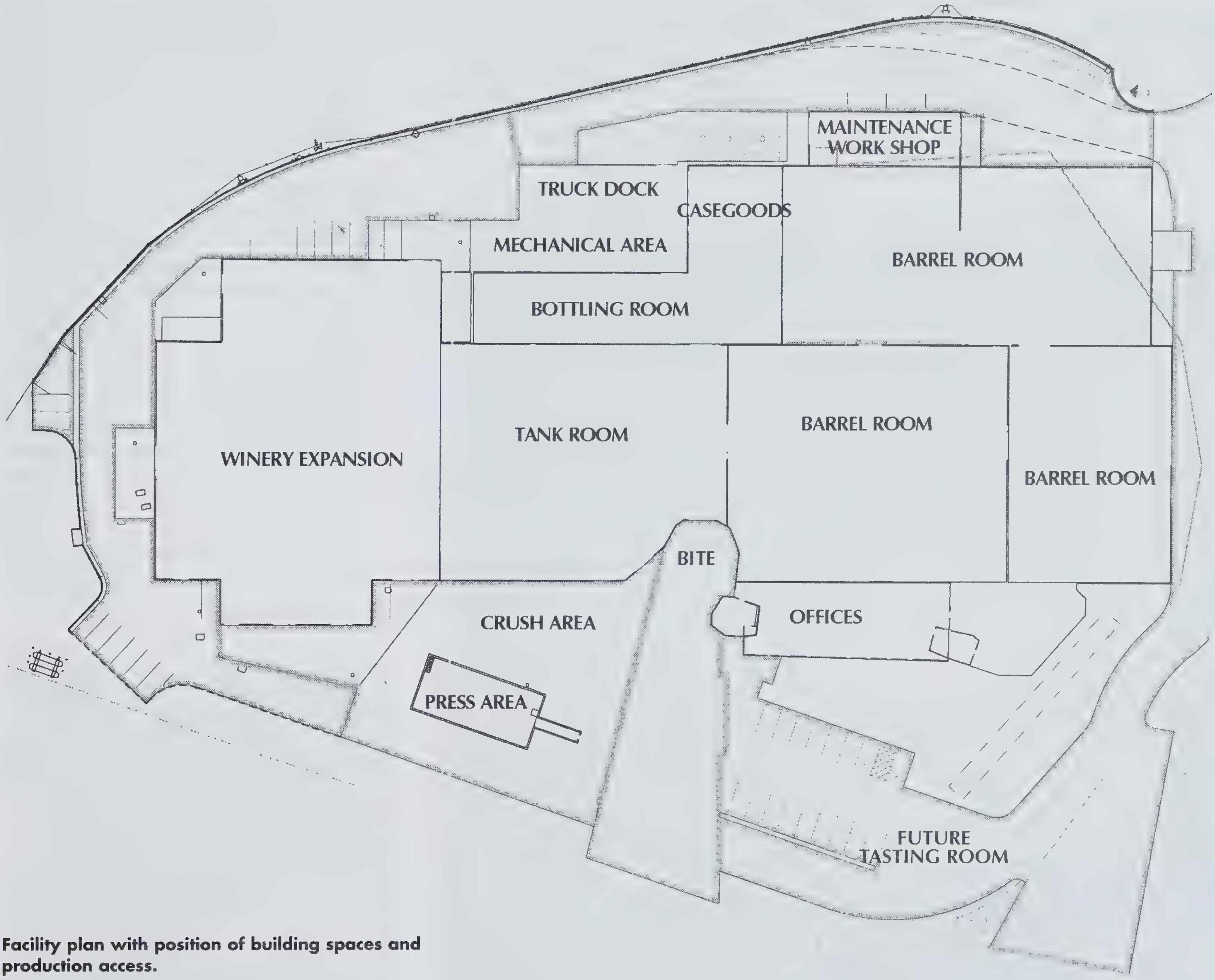


Facility plan with position of building spaces and production access.

The quarry has a tough, hard landscape with a palette of grays and browns, which the design team dealt with by using tilt-up, stained concrete on a major portion of the building. Concrete is the most cost-efficient material from a construction standpoint, and it is functional for a production facility. The concrete was cast in place on site, and in keeping with Ravenswood's whimsical side, its logo was cast into an exterior wall.

To address the section of the building where people are intended to gather, Anderson utilized wood — a warmer, more touchable material. The metal roof was designed to keep the facility looking like an agricultural shed, very much in line with the site's existing surroundings. Further, Anderson felt that all materials used would weather and soften over time, creating more of a blend between the landscape and building.

A very unique feature of the building is a concave portion that penetrates the fermentation room in the south exterior. This feature was nicknamed the "bite" during design since it appeared as if a bite was taken out of the building. In the future, the bite area will support a stairway leading to a roof deck.

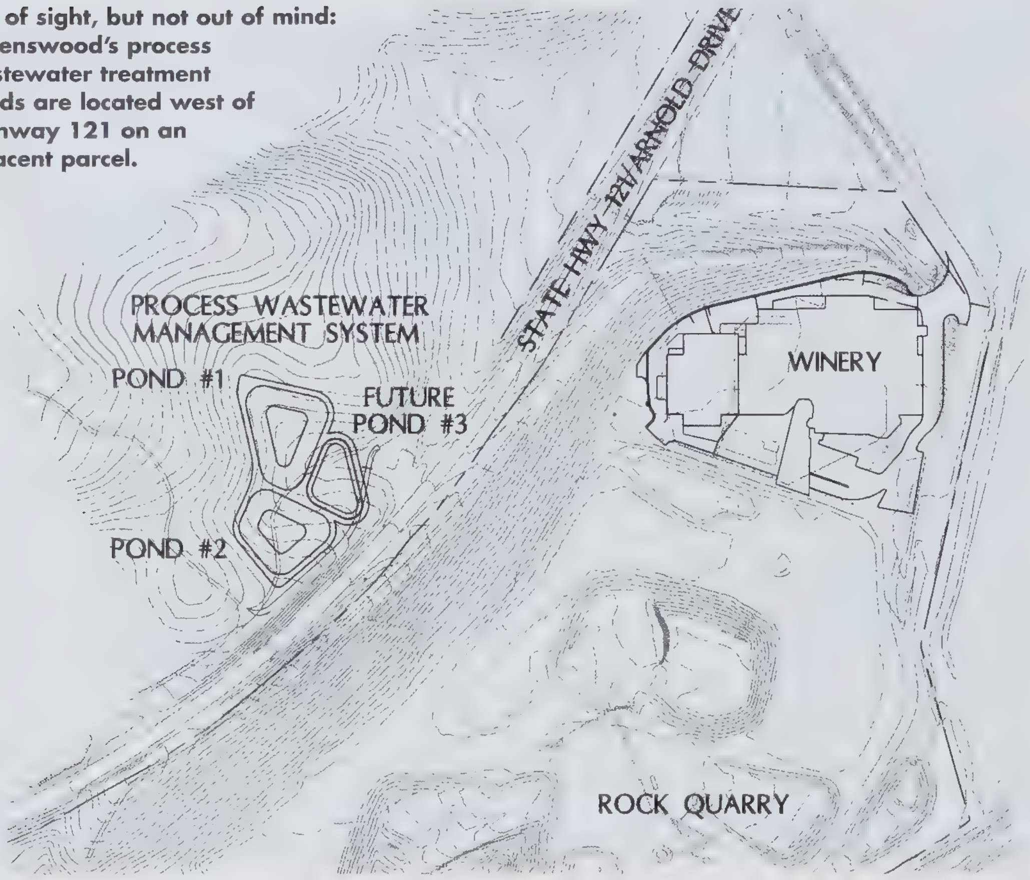
Windows were placed strategically around the bite so that as visitors climb the stairs, they will enjoy a self-guided tour of winery operations from the outside. A concrete "red carpet" and trench drain leading away from the bite was incorporated into the design to highlight the primary view of Mt. Diablo and its surroundings.

Functionally, the bite serves as a covered non-specific gathering place for people, and it also acts as a sun trap on the windy side of the building. For example, during Ravenswood's grand opening, the area served as a bandstand due to its excellent acoustics.

Industrious landscape

Landscape architect Julie Bargemann's philosophy for this project was "No Sissy Landscape." Since

Out of sight, but not out of mind: Ravenswood's process wastewater treatment ponds are located west of Highway 121 on an adjacent parcel.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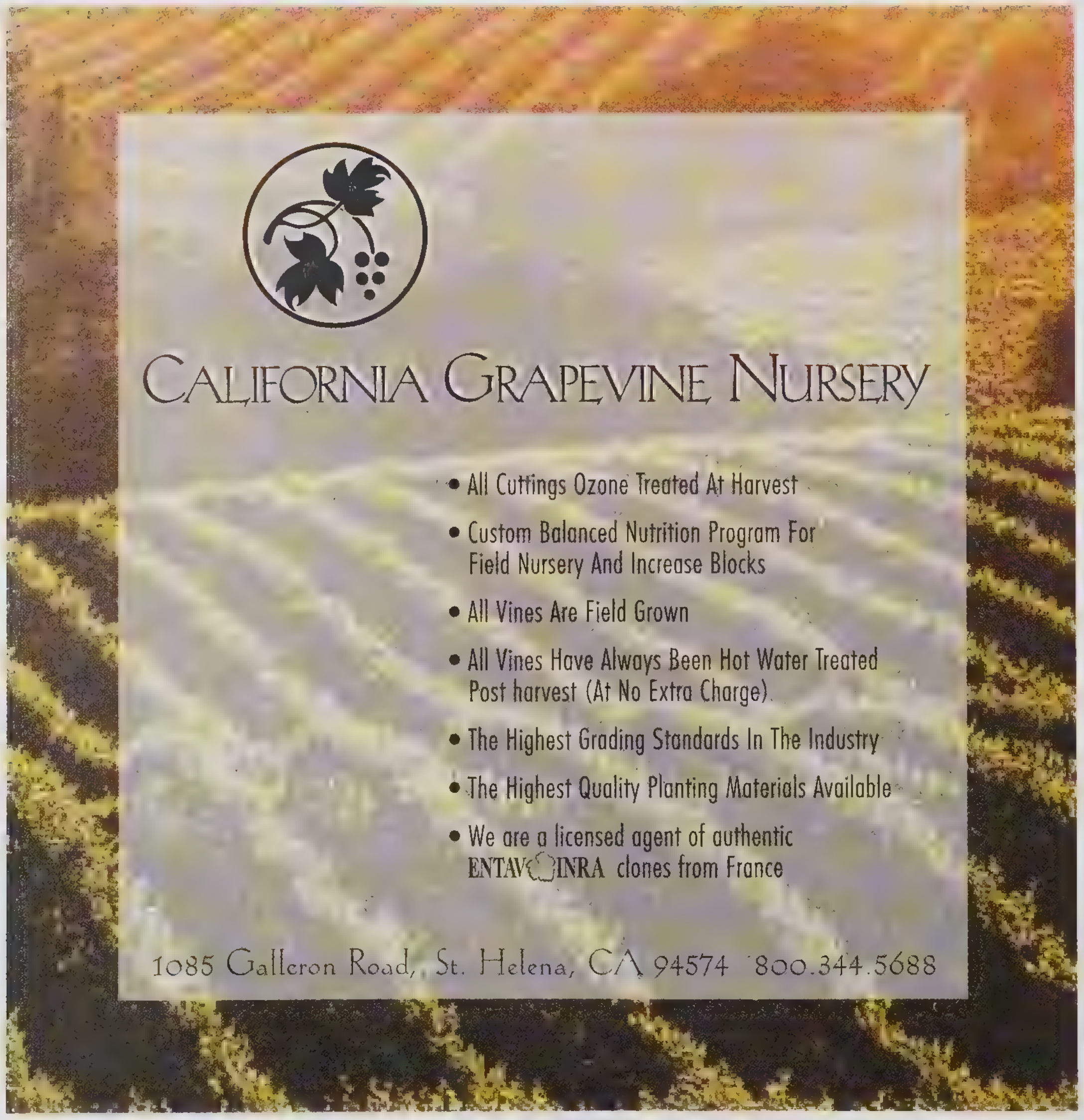
POND #2
WINERY
ROCK QUARRY

both the quarry and winery are large-scale production facilities, she wanted to continue the expression through large-scale productive materials. The quarry became a part of her design palette.

"The normative approach would be to separate the two operations," notes Bargemann, a specialist in industrial landscapes. "However, the best thing about this site was the juxtaposition of the two. Therefore, it was important to express it in both poetic and practical terms."

One very physical example is the "motherline" of boulders which frames the quarry (also known as "Justin's Stonehenge"). The separation between the winery and the quarry was necessary for safety reasons, but the 500-foot-long row of boulders, spaced 10 feet apart and taken directly from the quarry, allows for a transparency and expression of the quarry. The purpose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was to leave a connection that will exist long after the quarry ceases and the hole becomes a lake.

The hard-line areas of the exterior were created to show a mosaic of the ground plane of the site. This can be seen in the odd angles of the crush area and parking and roadway areas, and their individual materials. Parking and roadway areas are made of basalt, which adds contrast to the crush area's concrete, and also draws the quarry landscape in. There is a trellis made of industrial looking, galvanized steel, which also boasts hard angles. A water feature was designed to articulate the industrial look by using a metal pipe that runs water to a metal trough outside the offices.

Wastewater removal

Another unique element of the quarry winery development is the location and layout of the process wastewater treatment and disposal system. Process wastewater (PW) generated from winemaking activities flows by gravity to a collection sump located on the west side of the facility. PW is pumped up and over a 120-foot-high berm, through a cattle crossing under Highway 121, to a solids removal screen that discharges to the aerated ponds located approximately 1,800 feet from the winery.

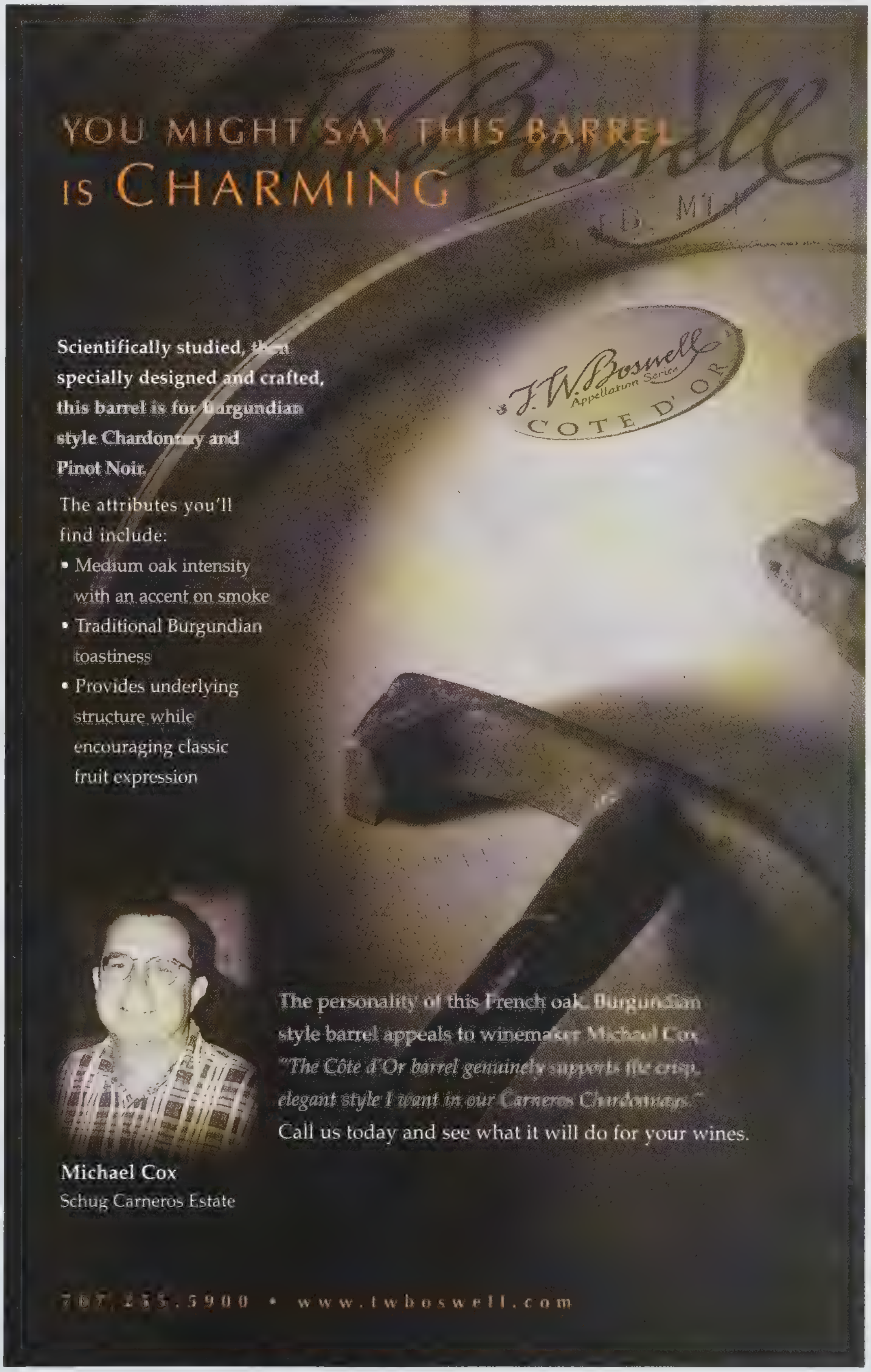
The pond site is located on an adjacent property (under the same ownership as the winery property) and was selected based on assessment of the terrain, vegetation, geotechnical considerations, and screening from public view. Conscious grading design of the two ponds (.95 million gallons and .65 million gallons) resulted in natural contouring and positioning of the ponds, along with balanced earthwork.

The pond system provides treatment of PW by a two-cell facultative aerated lagoon system, assisted by mechanical aeration. Treated wastewater from the second cell is reclaimed and disposed of by pasture irrigation near the pond area and landscape irrigation at the winery facility.

From crushing rock to crushing grapes

Ravenswood has produced wine for four years at the quarry location. "We hardly know the quarry is there, except for when we share the truck scale during harvest and when the quarry offers some amusement in the form of blasting and bulldozing," says Peterson. "It is a giant sandbox for adults."

Has the facility changed the winemaking style? "We always made the Vintner's



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Blend series at other facilities so we already had large production methods in place, but the new facility allows us to make better wine due to better equipment," replys Peterson. The new facility design has made it easier for Ravenswood to maintain volume in the style which customers have come to expect.

Phase III

During the original master planning for Phase I and II, Faggioli and Martin were looking to Ravenswood's future success and Phase III. Phase III was originally planned to include a significant increase in production capacity and addition of a public tasting/hospitality building. Commencement of public tasting would coincide with closing of the quarry.

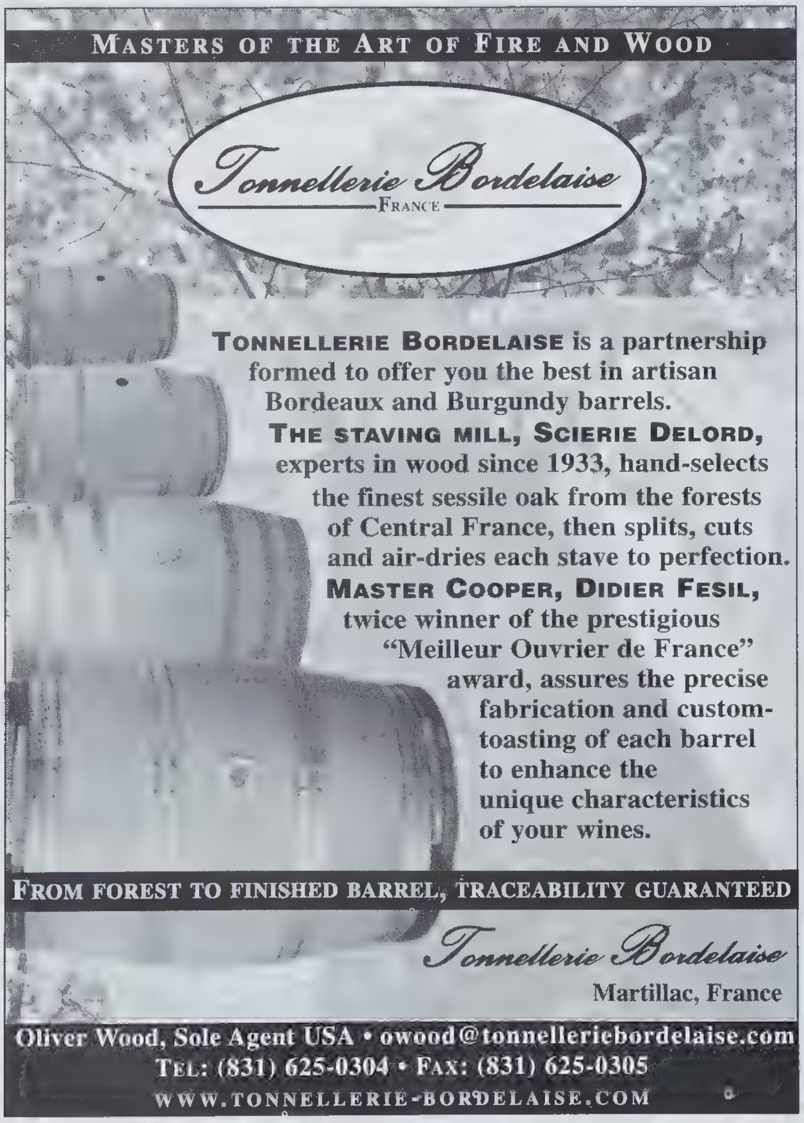
Due to Ravenswood's accelerated success, the need to move forward with Phase III occurred sooner than anticipated. During the final stages of Phase II construction, Summit was already moving forward with additional master planning and preparation of a new Use Permit application.

During Sonoma County's review of the new Use Permit application, Ravenswood was purchased by Constellation Brands. Constellation's plans for Ravenswood's growth included a production capacity increase to one million cases per year. The permit modification also included a 28,000-square-foot production building expansion, with a 4,500 square foot tasting/hospitality building for public use.

Production expansion was designed on the east side of the existing building, an area completely shielded from public view. The architectural design is a continuation of the existing structure in speaking to the quarry landscape.

Phase III includes addition of 24 open-top fermentors, 38 closed top fermentors, and 53 storage tanks. Two more punch-down devices will double the pneumatic punch-down capacity. A glycol system is being installed to supply cold glycol to the upper cooling jacket on tanks or warm glycol to the lower jacket. The warm glycol will encourage malolatic fermentation or help complete stuck fermentations and allow the possibility of warm maceration after alcoholic fermentation.

The proposed tasting/hospitality building will be detached and positioned southeast of the winery building. The building is perched along the edge of the quarry depression with a south exposure providing views over the future lake, tidal wetlands, and Mt. Diablo in the distance. The exterior deck at the bank of the future lake will allow the tasting public to take in the views while experiencing a wholly unique combination of winery and historic quarry. ■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Continued from page 27

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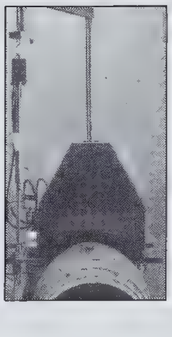

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CASE STUDY

Limiting barrel room losses through tight humidity control

BY Drew Robb

As at any outstanding winery, president Bruce Cakebread and winemaker Julianne Laks of Cakebread Cellars are always looking for ways to improve every step of wine production.

One major focus in recent years has been to carefully control the barrel room environment in order to optimize every aspect of the winemaking process. This includes reducing the amount of water and ethanol lost through evaporation, factors which affect wine flavor. Cellars and caves have been used for centuries as the ideal place to store wine, so Cakebread Cellars decided to copy the concept for its above-ground barrel rooms.

A fog humidification system is installed in barrel rooms at Cakebread Cellars.

"What we are trying to do for our barrel storage rooms is replicate the environment of a cave, including the humidity, temperature, and very low air movement, but on a controlled basis," says Cakebread, who served as winemaker from 1979 until becoming president in January 2002.

In 1996, Cakebread Cellars decided to humidify the barrel ageing room to rectify the widely varying levels of humidity within the facility. For example, on some days, the relative humidity would drop to 50%, causing full barrels to require excessive topping, and empty barrels to dry out and become loose.

Topping losses were running about 2.5%, or the equivalent of more than 2,000 cases annually. With the wines selling for $30 to over $100 per bottle, the loss was substantial. By using the humidification system for the barrel ageing rooms, the cellar losses were reduced by slightly more than 1% of the total wine volume, a savings approaching 1,000 cases per year.

"We realized that we had to better control all the variables within the barrel room," says Cakebread. "That way, we could keep the barrels tighter and attain far more control of losses."

After surveying the marketplace, Cakebread chose a high-pressure fogging system manufactured and installed by Mee Industries that has been making fogging systems for over 30 years. Mee systems are in use in more than 150 American wineries.

"We looked at other types of humidification systems, such as the type where the water hits a fan that blows it to the other side of the room," says Cakebread. "But with this system, we gained greater humidification uniformity throughout the building with no dripping."

The fan type of system may be useful in areas where there is a high airflow and there is a drain pan to catch unevaporated water. It could therefore be placed in the air handler room of an industrial plant. However, if used in a barrel room, where the airflow is low volume, it would result in high humidity and puddling, with mold growth near the fan and drier areas in other parts of the room. The fogging system, on the other hand, distributes the evaporation at numerous points throughout the room, producing even humidification and no puddling.

Water is an excellent solvent. In fact, it is compatible with more substances than any other solvent known to man. Sea water contains more than 60 dissolved elements, together comprising 35 grams of dissolved substances for each liter of water. Even spring water and well water contain dissolved elements, which give them a distinctive flavor and, in the case of sulfur, smell. Evian, for example, uses the dissolved minerals in its water as a selling point.

Prior to installation, therefore, Mee Industries conducted a thorough analysis of the water Cakebread Cellars intended to use in the humidification system. The water comes from a well. Water testing includes many components, such as turbidity, hardness, pH level, total dissolved solids, electrical conductivity, silica content, ferrous iron content, and chlorine level. The analysis determined the need for water softeners, or reverse osmosis (RO), and filtration.

In most instances, some form of filtration is used in combination with one of the other methods. Water softening, however, is not recommended in most barrel room environments. Although it reduces the amount of dissolved iron, calcium, and magnesium, it adds sodium to the water. This added sodium then settles out of the air as dust when the water evaporates.

Analysis of the well water at Cakebread Cellars revealed that a reverse osmosis (RO) purification system would bring the water purity up to the desired level with no excess minerals to settle as dust or spot glassware. The problem with RO water is that once all those minerals are removed from the water, since water is such a superb solvent, it starts dissolving the metal in the pipes as a replacement for the lost minerals. For some installations, it is advisable to add some calcium back into the water to make the water less corrosive.

The improvement in water quality from the RO system also benefited the winery elsewhere. It allowed the dishwasher to produce spot-free glasses for the tasting room, and for a tap to be placed in the laboratory.

However, since RO water is highly corrosive, standard steel piping couldn't be used. Instead, PVC piping carries the water from RO equipment through the pump to the barrel

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room. Once there, the water travels through ½-inch diameter and ¼-inch diameter, 316 stainless steel tubing to the fogging nozzles, which are made from a combination of brass and stainless steel.

Cakebread Cellars required a high standard in pipe placement and overall quality of workmanship. "The aesthetics of the whole barrel room are very important to us," says Cakebread. "We routed the pipes above the air ducts.

"We didn't want the humidification system to be the first thing people notice when they visit." As a result, the barrel room maintains its beauty while still providing the desired 79% humidity, a level high enough to reduce evaporative losses without the problems of condensation or mildew that can occur when the air is too moist.

Each swirl jet nozzle at Cakebread Cellars has a .006-inch orifice, and the water is kept pressurized to 1000 psi in order to produce droplets small enough for rapid evaporation. Each nozzle transforms 1/60th of a gallon of water into fog per minute. The number of nozzles needed for a particular location is based on the size of the cellar, level of humidity desired, and meteorological profile of the area. At Cakebread Cellars, the nozzles are spaced about 10 to 20 feet apart throughout the barrel rooms.

Fog system components

The humidification system used at Cakebread Cellars consists of the following equipment:

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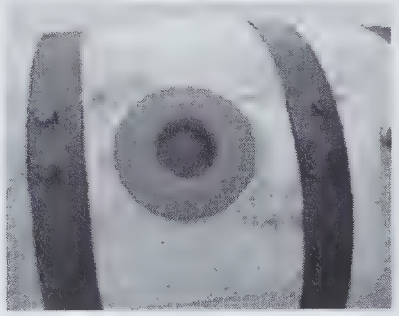

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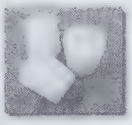

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2. Control system — Various types of controls can be used in fog systems. These include simple on/off switches or high-pressure solenoid valves for staged output. Alternatively, existing control systems can be hooked up to the fog system.
3. Fog nozzles — Mee Industries Swirl Jet nozzles (Model SJ7).
4. Filters — Each nozzle has its own filter. In addition, water filters are used to remove particulate matter. A combination of a 5-micron filter and a 0.35-micron filter work best to extend overall filter life.

"It's a pretty simple system, simple to operate and without a lot of moving parts," says Cakebread. "Since the pump, controls, and metrics are all on the ground, it makes it easy to service and troubleshoot."

Winery expansion

When the winery added a second 20,000-square-foot barrel room, so it could separately control the environment for red and white wines, a fog humidification system was installed in the new barrel room. A control unit made by Moon Valley Circuits (Glen Ellen, CA) in each room monitors the fogging system to keep each room at 79% relative humidity.

"To me, humidification control is one of those small but important aspects of winemaking," Cakebread concludes. "The humidification system adds to our ability to control all the variables that go into making fine wine." ■

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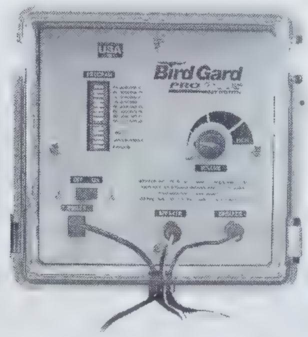

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Sulfur dust exacerbates Pacific mite outbreaks

Pacific mite levels vary depending on mildew controls.

BY Michael J. Costello,
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Mites are one of the most significant arthropod pests of grapes in California, with at least 250,000 vineyard acres treated with miticides in 2001.[1] It is well-known that mite outbreaks can be influenced by various environmental conditions, including dust, and vines weakened by water or nutrient stress, or poor soil conditions (such as compaction, extremes of pH, and shallow soil).

It has also been observed for many years that there is a relationship between sulfur use for powdery mildew and the spider mites Pacific mite (*Tetranychus pacificus*) and Willamette mite (*Eotetranychus willametti*). The earliest reference to this is 1950,[6] but given that the use of sulfur for mildew in California dates back to the late 19th century, observations were almost certainly made long before then.

Many vineyard managers maintain that since the introduction of sterol demethylation inhibitors (DMIs) to control mildew in the early 1980s, they have seen a drop in the incidence and severity of Pacific mite outbreaks.

In the 1980s, two field studies (independent of one another) found that Pacific mite numbers were significantly higher under a sulfur regime for mildew than when Bayleton® (a DMI) was used.[3,4] In addition, one of these studies found that sulfur decreased density of the western predatory mite (*Metaseiulus occidentalis*) and suggested that this was the cause for increased density of the Pacific mite.[4]

However, earlier laboratory studies found a fair amount of resistance to sulfur in predatory mites collected from vineyards, compared to orchards or native plants.[5] Other studies have suggested that sulfur decreases tydeid mites (*Pronematus* spp. or *Homeopronematus* spp.), which can be an alternative prey source for predatory mites.[2] Tydeid mites may also prey on Pacific mite eggs.

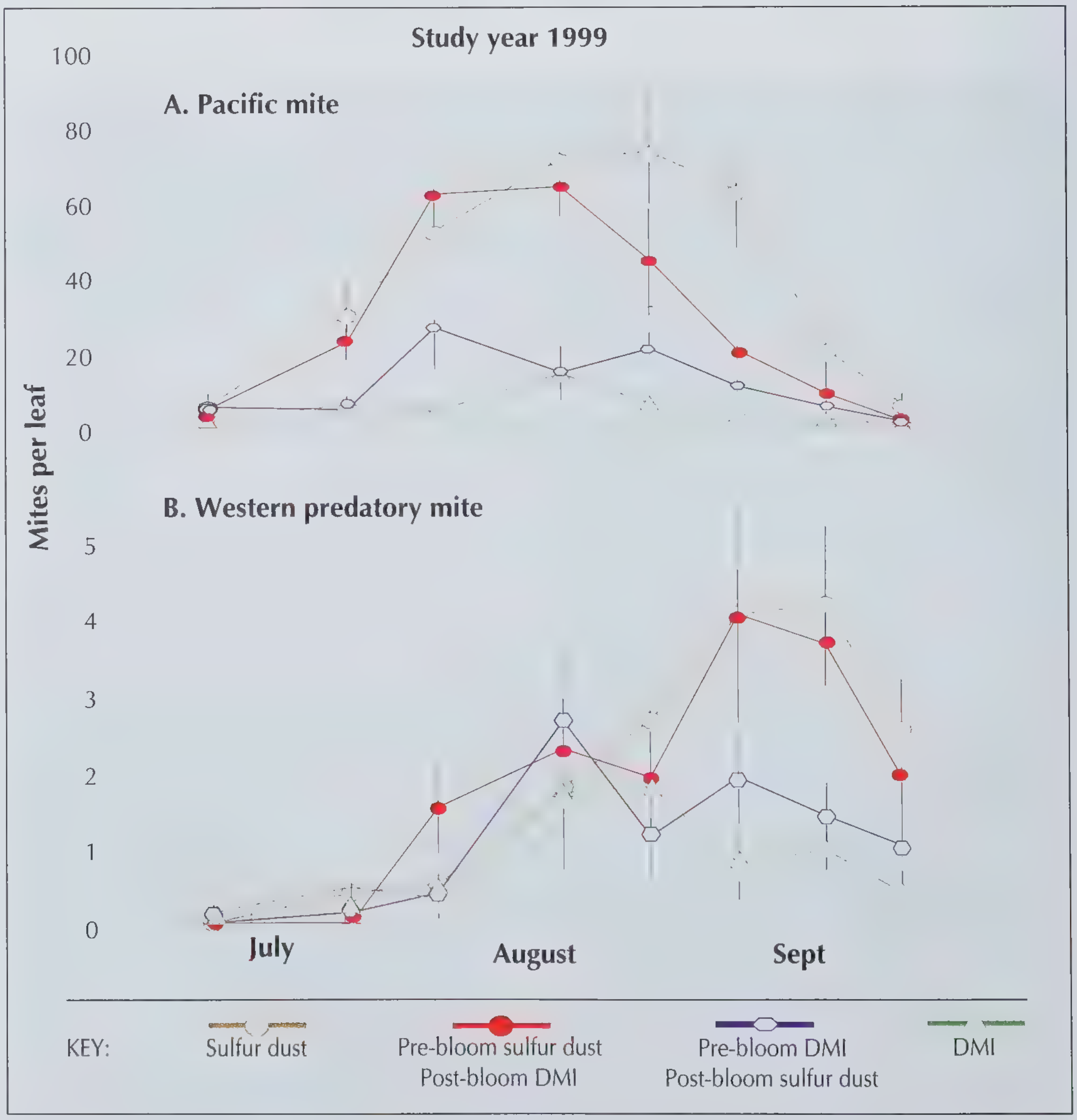

Figure 1: Pacific Mite and western predatory mite density, 1999 season.

Western predatory mite (right) feeding on two-spotted spider mite.

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Severe Pacific mite damage can be seen as burning of the foliage on the top of the canopy.

The hypothesis that sulfur is detrimental to predatory mites has been generally accepted by the grape growing community (see *PWV* March/April 2002, page 41). There is also a prevailing thought that wettable sulfur is less harmful on predatory mites than is sulfur dust, and that dusting before bloom is less harmful than post-bloom sulfuring.

Over the past several years we have undertaken a series of experiments to further test these hypotheses. Results presented here summarize studies done in 1999 (a year with high mite pressure), 2001 and 2002 (low pressure years). Because mite density was low in 2001 and 2002 and the treatment response was the same, the data from these years were combined for purposes of analysis and presentation.

Our field study site was an 80-acre block of Thompson Seedless in Fresno County (Sand Ranch, Britz Farming Co.). We compared mite density on vines treated with sulfur dust all season to those with DMI fungicides (Rubigan® or Procure® in 1999; Rubigan®, Procure®, Rally® or Elite® in 2001/ 2002) as a substitute. We also compared timing of fungicide applications pre-bloom and post-bloom.

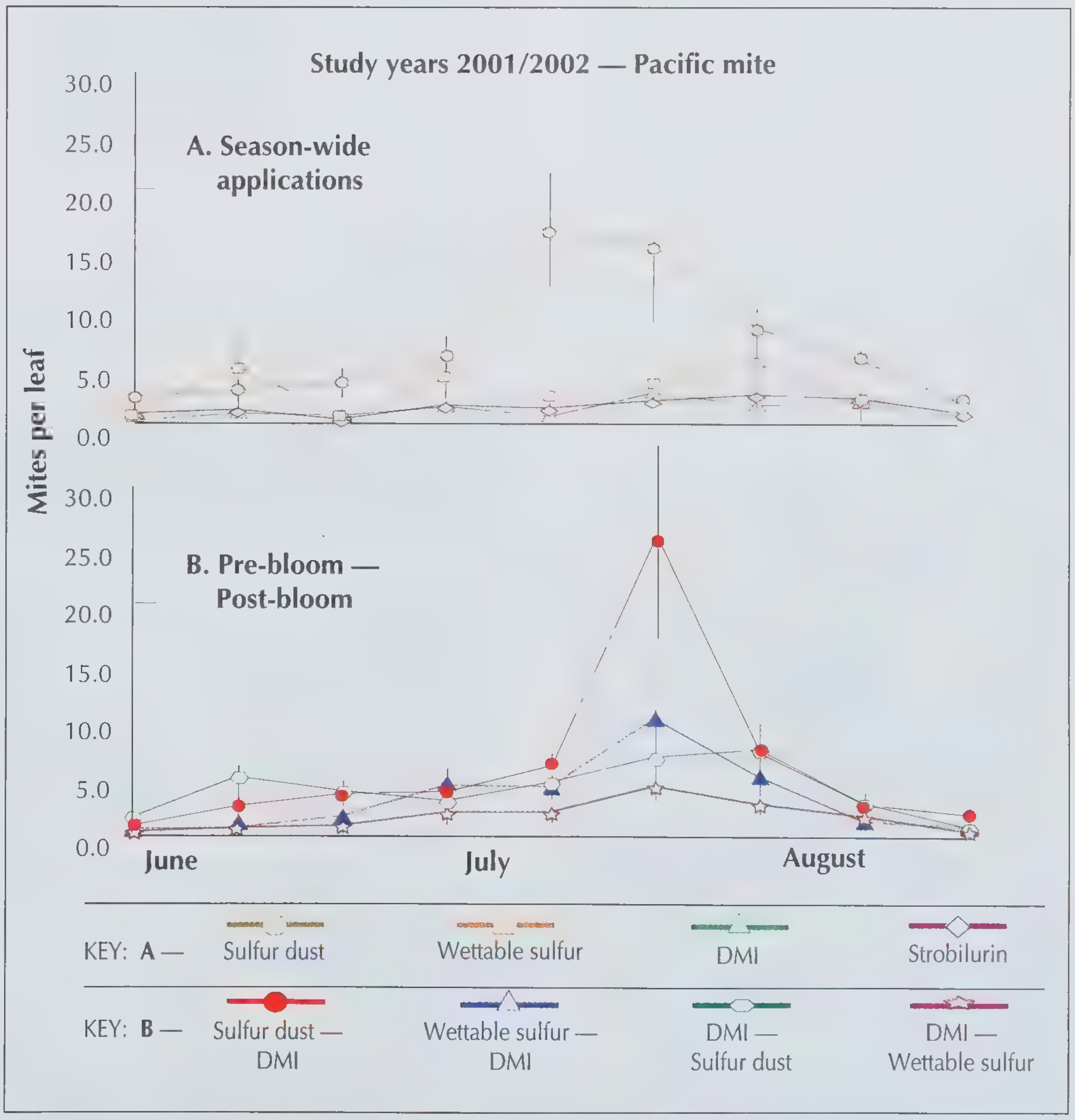

Figure 2: Pacific mite densities, combined 2001 and 2002 seasons

Table I. Treatment summaries for 1999 and corresponding average Pacific mite, Western predatory mite and tydeid mite densities.

	Average mites per leaf		
Treatment	Pacific mite	Western predatory mite	Tydeid mites
Sulfur dust all season	39.5 (4.9) a	1.98 (0.32) a	0.45 (0.08) b
DMIs all season	3.4 (0.8) b	0.64 (0.13) b	1.00 (0.17) a
Sulfur dust pre-bloom/ DMIs post-bloom	28.2 (4.0) a	1.89 (0.26) a	0.98 (0.14) a
DMIs pre-bloom/ sulfur dust post-bloom	10.8 (2.2) b	1.06 (0.21) b	0.34 (0.07)b

Letters (a, b) are for comparison of means among treatments.
Means with a common letter are not significantly different at $P<0.05$

In 2000 and 2001, a treatment of wettable sulfur was added (which differs from dusting sulfur in that it is formulated with a wetting agent that allows the sulfur to form a suspension in water which can be sprayed on). Wettable sulfur is typically applied at rates two to three times lower than dusting sulfur. In 2001 and 2002, strobilurins (Abound® or Flint®) were added as a comparison to the DMIs.

Applications of fungicides were made starting in early April and ending in late June/early July. Sulfur dust (10 lbs. per acre) and wettable sulfur (80DF at 4 lbs. per acre) were applied at a seven-day interval. DMIs and strobilurins were applied every two weeks. A total of five pre-bloom and four post-bloom (three in 2002) sulfur dustings were made.

Treatment summaries are presented in Table I. The plot size at the study site was two acres. Twenty leaves per plot were collected and processed through a mite brusher onto a glass plate. Ten percent of the resulting sample was analyzed for Pacific mite, Western predatory mite, and tydeid mites. Treatments were replicated four times.

In the laboratory, we tested the effects of four fungicides (dusting sulfur, wettable sulfur, Rally®, and Quinoxyfen®) on the mortality of Western predatory mite. Predators were placed onto 2 cm-wide leaf disks with a sufficient number of two-spotted spider mites as a food source.

The leaf disks were then sprayed with fungicides at these equivalent field rates: dusting sulfur at 50 lbs. per acre, wettable sulfur at 4 lbs. per acre, Rally® at 4 oz. per acre, and Quinoxyfen® at 4 fl oz. per acre, and held at 77°F (25°C) for 48 hours before evaluation. It should be noted that although we attempted to apply dusting sulfur at an appropriate field rate, the 50 lbs. per acre equivalent that we applied was four to five times higher than is typically used by growers. The source of the predatory mites was Sterling Insectary (Visalia, CA).

Field results:
Pacific mite

The field data (Figs. 1a and 2a) include some very clear results. Pacific mite numbers were consistently highest with season-wide sulfur dust compared to all other treatments, and were considerably lower with non-sulfur fungicide treatments. This result was maintained in both high and low mite pressure years: in 1999 the peak mite count with season-wide sulfur dusting was five times higher than with DMIs, and in 2001/2002 it was nine times higher. In addition, in 2001/2002, the peak mite count under sulfur dusting was more than 10 times higher than with the strobilurin treatment, and over three times that of the wettable sulfur treatment.

There is also a clear pattern of Pacific mite response to timing of sulfur dusting (Figures 1a and 2b). In 1999, pre-bloom sulfur dusting with post-bloom DMIs produced results almost equivalent to that of season-wide sulfur dusting, whereas reversing the timing produced results equivalent to season-wide DMIs.

In 2001/2002, the seasonal peak with pre-bloom sulfur dusting and post-bloom DMIs was about the same as season-wide sulfur dusting. Reversing the timing, that is, applying DMIs *before* bloom and sulfur dust *after* bloom, resulted in peak mite density more than three times lower than sulfur dusting all season in 1999 and more than twice as low as in 2001/2002.

Table II. Treatment summaries for 2001/2002 study years, plus corresponding mean Pacific mite, Western predatory mite and tydeid mite densities.

	Average mites per leaf		
Treatment	Pacific mite	Western predatory mite	Tydeid mites
Sulfur dust all season	7.1 (1.2) a	0.44 (0.08) a	1.05 (0.11) ab
DMIs all season	1.2 (0.2) b	0.15 (0.04) b	0.94 (0.11) ab
Wettable sulfur all season	2.5 (0.5) b	0.24 (0.05) a	0.70 (0.08) b
Strobilurin all season	1.1 (0.2) b	0.30 (0.05) a	0.99 (0.11) ab
Sulfur dust pre-bloom/ DMIs post-bloom	6.1 (1.2) a	0.21 (0.05) b	1.23 (0.13) a
DMIs pre-bloom/ sulfur dust post-bloom	3.3 (0.5) b	0.18 (0.05) b	1.00 (0.11) ab
Wettable sulfur pre-bloom/ DMIs post-bloom	4.0 (0.5) b	0.22 (0.04) b	1.19 (0.12) a
DMIs pre-bloom/ wettable sulfur post-bloom	1.6 (0.3) b	0.12 (0.03) b	0.64 (0.08) b

Letters (a, b) are for comparison of means among treatments.
Means with a common letter are not significantly different at $P<0.05$

Table III. Laboratory mortality of western predatory mite.

Treatment	% Mortality
Water control	5.6
Rally	11.1
Quinoxyfen	12.1
Wettable sulfur	16.9*
Dusting sulfur	21.0*

Means followed by an asterisk are significantly different from the control at $P<0.05$.

Field results: Western predatory mite and tydeid mites

Our field studies also show clearly that there is no long-term negative effect of sulfur dust on the Western predatory mite. In fact, predatory mites tended to be highest where Pacific mite densities were highest, which coincided with sulfur dusting. This was the case in 1999 with season-wide and pre-bloom sulfur dusting (Fig. 1B), and in 2001/2002 with season-wide sulfur dusting (Fig. 3A). The exception was the 2001/2002 strobilurin treatment, which had one of the highest densities of predatory mite (Fig. 3B), but a relatively low density of Pacific mite (Fig. 2A).

In 1999, the pattern of tydeid mite density was very consistent (Table I): season-wide and post-bloom sulfur dusting had densities less than half that of season-wide DMIs and DMIs post-bloom, suggesting that mid- to late-season sulfur dusting had a negative impact on tydeid mites.

In contrast, season-wide and post-bloom sulfur dusting in 2001/2002 did not have a negative effect on tydeid mites relative to DMIs, although season-wide and post-bloom wettable sulfur applications did (Table I).

Laboratory results

None of the fungicide treatments in the laboratory had a major impact on the mortality of the Western predatory mite (Table II). Neither Rally® nor Quinoxyfen®, at about the 10% mortality level, was statistically different from the water control at 5% mortality. Although the two sulfur treatments were statistically different from the control, wettable sulfur averaged just 16% mortality and dusting sulfur only 20%. Note that the dusting sulfur was applied at four to five times the typical field rate.

Conclusions

Our results support earlier observations and experimental data, showing that there is a strong relationship between sulfur dusting and the density of Pacific mite on grapes. Mites were considerably higher in number on sulfur dust-treated vines compared to all other fungicides tested (including wettable sulfur), and the response held steady whether the overall mite pressure was high (as in 1999) or low (in both 2001 and 2002).

It is possible that the difference between sulfur dust and wettable sulfur was due to a difference in formulation, but more likely it is simply a matter of rate: dusting sulfur is used a rates of 10 to 15 lbs. per acre, whereas wettable sulfur is used at 3 to 4 lbs. per acre. We think it likely that if wettable sulfur were used at an equivalent rate to sulfur dust, the effect on the mites would be the same.

We found little negative effect of sulfur dust on the Western predatory mite in either field or laboratory settings. In the field, the highest density of predatory mites tended to be concentrated where Pacific mite density was highest, which makes perfect sense in terms of predator-prey dynamics. Because the season-wide and post-bloom sulfur dust applications had the highest Pacific mite densities, these treatments had the highest densities of predatory mites, which goes contrary to popularly held belief.

We don't know why predatory mite density was high in the strobilurin treatment, because this cannot be explained by Pacific mite nor tydeid mite density.

In the laboratory, predatory mite mortality with sulfur dust was only 20%, even though a rate three to four times higher than the typical field rate was used.

We think it is quite logical that vineyard populations of the Western predatory mite have evolved resistance to sulfur, because there are two factors that increase the selection pressure: they are exposed at all life stages to treated plant material, and they cannot

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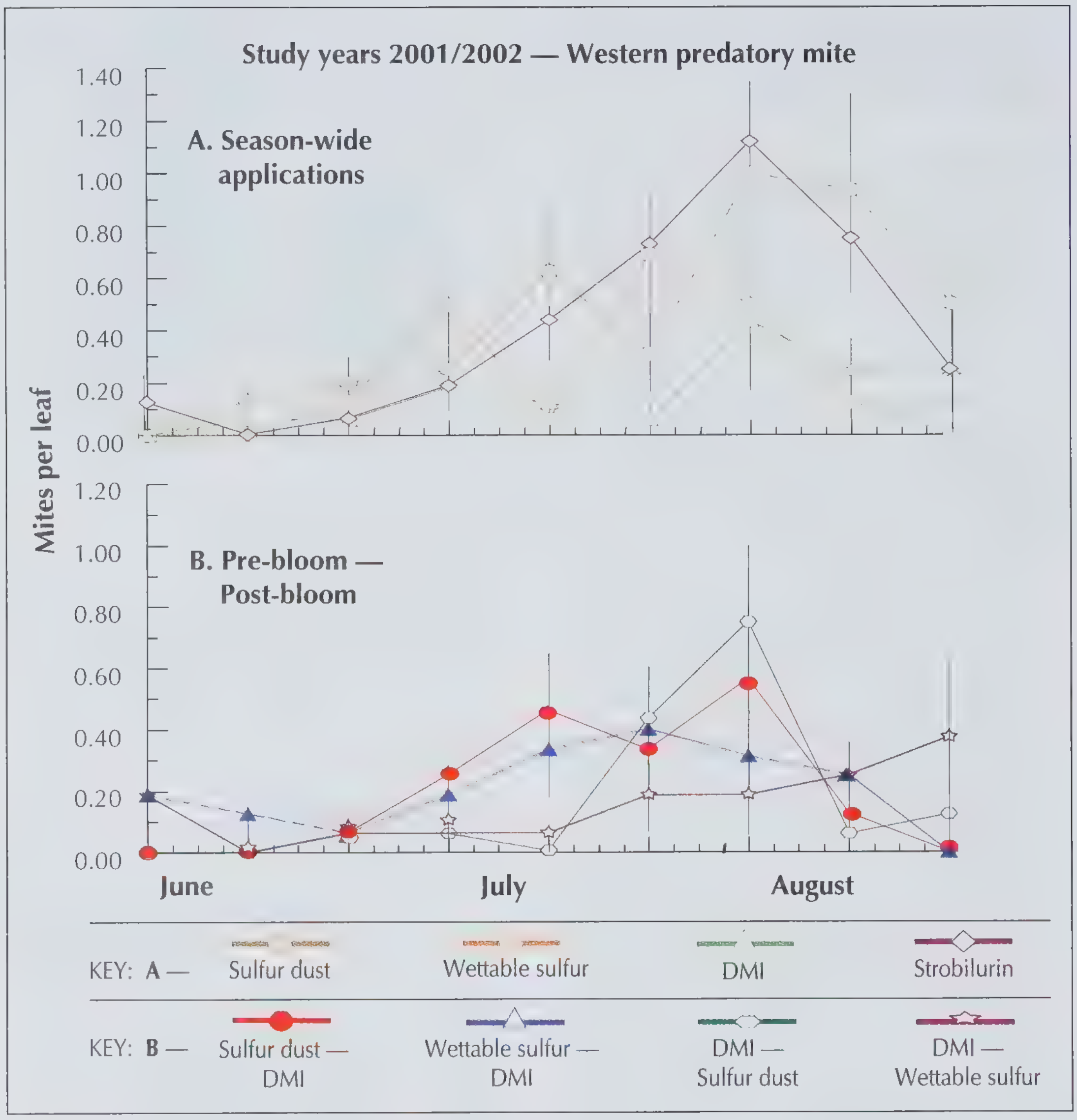

Figure 3: Western predatory mite densities, combined 2001 and 2002 seasons.

easily emigrate from treated vineyards because they have no wings.

Other laboratory studies have found a certain amount of resistance to sulfur in predatory mite collected from vineyards compared to orchards or native plants.[5] While it is certainly possible that sulfur suppresses predatory mite buildup, there is no evidence that the effect is lasting.

What other reasons could there be for the relation between sulfur dust and high numbers of Pacific mite? One possibility is that sulfur suppresses tydeid mites, and if these feed on Pacific mite eggs, it may allow increased survivorship of Pacific mite. This hypothesis is pretty well supported by 1999 data (Table I) but not 2001/2002 data, as only wettable sulfur (but, curiously, not sulfur dust) had a negative impact on tydeid mites (Table II).

Another possibility is that sulfur suppresses a fungal pathogen of Pacific mite, but this seems unlikely, given the high humidity requirement of arthropod-invading fungi and the dry conditions that prevail during summer in the San Joaquin Valley.

Neither the tydeid- nor mite-pathogen hypotheses can explain two observed patterns. First, the difference in pre-bloom and post-bloom timing. Limiting the application of sulfur dust to the pre-bloom period produces an effect similar to sulfur dusting all season.

Second, there is a long lag time between the end of sulfur dusting and mite outbreaks. Applications of sulfur dust in April and May produced an effect (high Pacific mite density) that was seen in July, August and even September.

For this reason, we think that the most plausible explanation is that a plant-based factor is involved, and that somehow sulfur is suppressing the ability of the vine to defend itself against mite attack. It may somehow be blocking the pathway that turns on the genes for defense against mite attack, a response that is well-known.[6]

We will continue to look at these and other questions in the future. One of us (Michael Costello), along with Cal Poly's Keith Patterson, and Kris O'Connor and Craig Macmillan of the Central Coast Vineyard Team, will be studying the effects of sulfur on Willamette mite, the major mite pest in coastal vineyards. Catherine Albers hopes to continue her studies on mites in graduate school in the near future.

Acknowledgments

We thank Kip Green, Gurmit Singh, and Martin Britz of Britz Farming Inc., Fresno, for their indispensable assistance in this project, including providing the field site, materials, labor, and advice for the study. Data collection efforts came from Cal Poly students Shawn Veysey, Chris Boisseranc, Rachel Power, Kevin Robertson, Alfredo Koch, and Kimberly Becker. We are grateful to CATI at Fresno State University and the CSU Agricultural Research Initiative (ARI) for providing funding for the studies. ■

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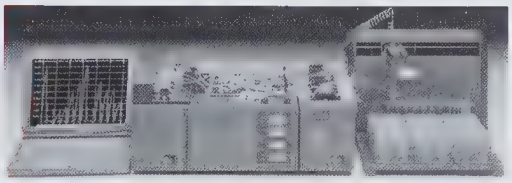

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VINQUIRY

New yeast strains: Vinquiry adds Enoferm 58W3 and Enoferm MT to its line of yeast isolates and continues to offer 35 others to make suitable matches for fermentation and wine style. The new Pro-Restart strain, QA23 "beads in a bag," is for direct restart of stuck or sluggish fermentations. Vinquiry's experienced and knowledgeable staff offers yeast and nutrient recommendations to optimize fermentation conditions for wine quality and to avoid stuck fermentations. The Vinquiry line of liquid concentrate yeasts has been expanded.

New nutrients: Acti ML is a nutrient specific for Enoferm Alpha malolactic bacteria, and OptiRED™ is an inactive yeast product to improve body, color stability, and mouthfeel in red wines. Nutrient selections include Go-Ferm, a source of bioavailable micronutrients added directly to the yeast rehydration water. Trials have shown improved slope and shorter time to dryness at the end of fermentation. Nutrients Fermaid K, Actiferm 1 & 2, Cerevit, and Oenovit are available, and a new bacteria strain, Enoferm Beta, has been added.

Carefully selected products from the Martin Vialatte line for premium wine production include Taniraisin, a new grape tannin from white grape must, and Efferbaktol 50, a granular form of effervescent SO_2 available in three tablet-form sizes. Other tannins include: Oenotan, Tanichene, and Vitanil AS, B, and VR.

Available fining agents include: Aquacol, Gelatin Extra, Gelisol, Albuminocol, Solugel, Cristaline, Miracol, Ovocol, Polycase, PVPP, and Polypresse.

Expanded enzyme selections include Lallzyme Beta, C, EX, EX-V, and the new Lallzyme Cuvee Blanc.

For more information, contact:
Vinquiry
7795 Bell Rd., Windsor, CA 95492
tel: 707/838-6312; fax: 707/838-1765

PLEASE SEE VINQUIRY'S AD, PAGE 31.

Glass Pak®

domnick hunter, a 40-year-old company, has joined with *Glass Pak®* in Fairfield, CA, to supply membrane filters, pads, housings, and technical support for the wine industry in California, Oregon, and Washington. Aaron Mosley, veteran staff winemaker, will come to your winery to assist with any filtration problems that arise, usually with immediate diagnosis.

Glass Pak® is also supported by *domnick hunter's* technical center in Charlotte, NC which is available for filter analysis as part of the service. *Glass Pak®* supports this program with on-hand inventory and same day shipment.

For more than eight years, *domnick hunter* membranes have been made with PES (polyethersulfone), a membrane material with a molecular structure that allows for better flow rates at lower differential pressure. PES is now being promoted as "new technology" by other filter suppliers. *domnick hunter* final membranes are fully validated and 100% integrity tested prior to shipment.

For more information please call:
Glass Pak®
Larry Warren or Dallas Nelson
5000 Fulton Dr., Fairfield, CA 94534
tel: 707-207-0400; fax: 707-207-0900
e-mail: gpfilters@aol.com

PLEASE SEE THE GLASS PAK AD, PAGE 78.

The Wine Lab

High-quality fermentation products are available from The Wine Lab. Red Star®, DSM (GB), and Chr. Hansen make a comprehensive range of premium and specialty yeast strains. Viniflora™ oenos and CH-35 cultures from Chr. Hansen are industry leaders for direct inoculation of malolactic fermentation assisted by special malolactic nutrients, Leucofood, and Leucovit.

Winemakers rely on The Wine Lab's proprietary nutrients (Superfood®, Startup) and vitamins (Vitamix) to promote yeast growth and survival, and to help prevent stuck ferments. Only "primary growth" yeast products are used to provide optimum nutrition and lessen flavor impact. Extensive nutrient supplementation information and guidelines are provided. The testing of juice nitrogen (ammonia and NOPA) is highly recommended.

Rapidase Ex-Color, and CX enzymes, and AR2000 aroma enhancer are available, and Inovapure Lysozyme to treat and prevent attacks by aggressive *Lactobacilli*.

Competitively-priced cellar and lab chemicals, supplies, labware, instruments, and technical books are available.

Besides BATF-certified chemical and microbiological analysis, The Wine Lab advises winemakers on many wine quality issues. Each year, Lisa Van de Water and staff give numerous technical seminars and training sessions for wineries in several countries on wine microbiology and other topics.

New Zealand, Chile, and Uruguay are part of The Wine Lab's global network of international technology, consultation, and products.

A free color catalog is available upon request.

For more information, contact:
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tel: 707/224-7903 or 800/224-WINE
fax: 707/255-2019
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StaVin Incorporated

StaVin offers versatile and cost-effective Oak Integration Systems with French, Hungarian, or American oak seasoned for three years and available in three toast levels. To ensure thorough heat penetration and complex flavors, all oak is traditionally fire-toasted.

StaVin's website, www.micro-ox.com, discusses how its oak and a micro-oxygenation system replicates the benefits of winemaking in barrels within tanks. Also, read how StaVin's Oak Bean and Segments effectively cross-link grape tannins to build mid-palate structure and stabilize color in red wine fermentation.

Packaged in food-grade, FDA-approved nylon bags, StaVin's French, Hungarian, and American Oak Beans (10-lb and 20-lb bags), and French Oak Stave Segment (15-lb bag) are convenient systems to impart oak flavors within tanks.

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To impart neutral barrels with the complexity and quality of new oak barrels, use StaVin's Oak Barrel Replica, Traditional Barrel Insert (now available in a new barrel extraction level), or Infusion Tube.

For more information, contact:
StaVin Incorporated
Alan Sullivan, Steve Sullivan,
Dr. Jeff McCord, Jamie Zank
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LALLEMAND

Lallemand produces more than 180 different yeast and malolactic bacteria cultures for the international winemaking community. Commitment to research and development in the area of winemaking fermentation continues to be Lallemand's primary goal for over 25 years.

Lallemand is introducing encapsulated yeast technology in 2003. The technique of encapsulating yeast cells enables the substrates and metabolites to diffuse throughout the gel without releasing the *Saccharomyces* cells into the must. Primary benefits are convenience and improved wine quality by keeping potential spoilage and processing at a minimum.

Bacteria — Direct inoculation cultures Lalvin 41 and Enoferm Beta are the newest ML cultures being offered. Both ML cultures work under difficult conditions and have specific sensory contributions such as increased mouthfeel.

Nutrients — Primary fermentation nutrients include the popular Fermaid and Go-Ferm brands. Lallemand continues to evolve its product line and update recommendations to keep up with breakthroughs from its laboratories and partner universities and institutes throughout the world.

OptiRED™ — is used at the beginning of red wine fermentation to obtain fuller-bodied, more color-stable, smooth-palate wines.

Contact Lallemand for assistance in choosing the best fermentation tools suited to your resources and stylistic goals.

For more information, contact:
Lallemand
Gordon Specht
PO Box 5512, Petaluma, CA 94955
tel: 707/526-9809; fax: 707/526-9803
e-mail: gspecht@lallemand.com
website: www.lallemandwine.com

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WORLD COOPERAGE OAK ALTERNATIVES

World Cooperage produces oak alternatives from the same high-quality wood as its barrels. These cost-effective products, available in air-dried and toasted French, Eastern European, and American oak, impart refinement and oak flavor to wine.

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High Vanilla Oak Chips

Popular this year is the company's High Vanilla Oak Chips made in France using a proprietary toast developed by World Cooperage engineers that maximizes vanillin production.

Designed with versatility in mind, the company's Tank Staves can be used in a variety of horizontal or vertical configurations, depending on winery needs. World Cooperage's Tank Staves are quick and easy to install and dismantle using minimal hardware and are available toasted using a convection or infrared heat process.

As a service to wineries, Paul Abbott is World Cooperage's full-time oak alternative specialist. His in-depth understanding of these products and their application help winemakers find the product that best fits their winery's environment.

For more information, contact:
World Cooperage
Paul Abbott
2557 Napa Valley Corporate Dr., Ste. D,
Napa, CA 94558
tel: 707/255-5900; fax: 707/255-5952
e-mail: paul@worldcooperage.com
website: www.worldcooperage.com

PLEASE SEE WORLD COOPERAGE OAK ALTERNATIVE AD, PAGE 36.

LESAFFRE YEAST CORPORATION

Lesaffre International marks its 150th year of continuous operation in 2003 and Lesaffre North America proudly celebrates the 40th anniversary of pioneering the first commercially grown yeast for the winemaking industry with its Red Star® brand.

Lesaffre Yeast Corporation continues to offer its Premier Cuvee, Cote des Blancs, Montrachet, Pasteur Red, and Pasteur Champagne strains of wine yeast, and the benchmark of nutrient compounds, Superfood®.

As the Lesaffre Yeast Corporation moves forward, it is pleased to offer the expanded Springer Oenologie range of specialty fermentation products.

Please visit the Lesaffre Yeast Corporation's website at www.lesaffreyeastcorp.com to contact any of its wine industry distributors for more information: American Tartaric Products, **Gusmer***Cellulo* Co., The Wine Lab, or Presque Isle Wine Cellars.

For more information, contact:
Lesaffre Yeast Corporation
Kevin Harrity, Sales Manager
e-mail: Kevin.Harrity@lesaffreyeastcorp.com

PLEASE SEE LESAFFRE YEAST'S AD, PAGE 29.

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INNERSTAVE LLC

"Shaping the taste of fine wines" has been the most fulfilling activity for more than 22 years at Innerstave, the originator of the barrel insert.

Winemakers appreciate Innerstave because of its non-invasive, no welding, cleanable design. Little effort is required of cellar staff because Innerstave is installed for free by its own qualified coopers. Innerstave's coopers also provide quality barrel consultation and repair and its sales staff has many creative solutions for barrel and tank problems.

Innerstave's highest acclaim is for its award-winning flavors found in wines of all price ranges, including ultra premiums.

The supply of on-site, air-dried French, American, and Oregon oaks ensures availability of high-quality, seasoned oak for every order. Winemakers can use Innerstave to manage and control wine-to-wood ratios, oak type, and toast levels. Most find that using Innerstave allows them to reduce winemaking variables and better predict finished wine flavors, and the use of Innerstave at any time during the wine's life gives the winemaker better control of the wine's character.

Innerstave's oak chips, called "OakPLUS," have been a flavor benchmark for oak chips used in wineries. The low-dose, high-flavor impact of these chips makes them one of the most requested chips in the industry.

For winery friends who have small lots of wine or are far away from Innerstave's home in Sonoma, CA, Innerstave offers Chain O' Oak, a self-install alternative to new barrel Innerstave.

Innerstave guarantees satisfaction in everything it does!

For more information, contact:
Innerstave, LLC
Bob Rogers
24200 Arnold Dr., Sonoma, CA 95476
tel: 707/996-8781; fax: 707/996-1157
e-mail: bob@innerstave.com

PLEASE SEE INNERSTAVE'S AD, PAGE 7.

PICKERING WINERY SUPPLY

Pickering Winery Supply distributes a special potassium caseinate, Vinpur Special, from Meggle of Germany.

Casein has long been recognized in Burgundy and Australia as an effective, gentle way of removing bitterness, brown pigments, and oxidized phenols in red and white wines. While many winemakers in the U.S. have tried it, even more have been put off by the difficulty of the agent's application.

By using cellulose as a carrier, Meggle has solved this problem with a product that can be directly dispersed in your wine. This means that casein's excellent characteristics in the lab can be easily reproduced in the winery; a predictability that allows you to selectively target different components in your wine.

Most wineries that have tried it now look upon Vinpur-Special as more than just a problem-solver: it has become an integral part of their winemaking process.

For more information, contact:
Pickering Winery Supply
John Pickering
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617

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TEN LEVERS

to promote financial agility and profitability

BY James D. Bielenberg, CPA,
Kendall-Jackson Vineyards,
Santa Rosa, CA,
Liz Thach, Ph.D.,
Sonoma State University,
Rohnert Park, CA

The wine industry presents substantial challenges to those bold enough to make their livelihood from it. From its natural cycles of supply excess and shortage and the consequences of improper supply chain management to the challenges of long production cycles, a perishable product, the cost of financing inventory, and the acceleration of global competition, the risk is enormous. As a result, the ability to effectively manage every financial component of a winery's business grows more critical each day.

By using the 10 business levers described below, you can drive optimum performance in your winery. The 10 levers are:

- ➪ **Your market**
- ➪ **Sales and distribution**
- ➪ **Material procurement**
- ➪ **Facility and capital investment**
- ➪ **Production overhead**
- ➪ **Human resources**
- ➪ **Inventory management**
- ➪ **Finance**
- ➪ **Marketing**
- ➪ **Legal**

Imagine yourself at the control of your winery, where these business levers await your attention. When you adjust the levers, the performance of your winery will go up or down. How do you determine which levers to maneuver at what time?

Know your winery strategy

Operation of the 10 levers will get you nowhere until you know where you want to go. What is your winery strategy; what is your vision for the future? A clear wine business strategy requires clarity in four areas: 1) Main intent (growth, stability, lifestyle, planned acquisition or exit strategy, etc.); 2) Customers/Geography; 3) Product; and 4) Size. Consider these three wineries:

- **Global Mogul Winery** — Main intent is to *grow* in case production and revenue by building a global brand, focusing on mid- to luxury-level customer segments on three continents. Product line may include five or more major grape varietals and multiple brands or labels; owns and buys grapes; produces over three million cases per year; sells 75% of its wine domestically and the rest overseas in Europe and Asia. Has strong relationships with major distributors.
- **Mid-Size Winery** — Main intent is to build a unique brand with loyal following of consumers who seek quirky, differentiated image. Slower to stable growth, but with plans to use brand to expand into other product lines, such as logowear and unique food products. Product line includes four major grape varietals and two different labels; owns a small amount of vineyards, but buys most grapes through long-term contracts. Produces 300,000 cases. Focuses on unique branding with quirky labeling. Sells 80% domestically and the rest in Canada, the United Kingdom, and Japan. Sells primarily through smaller distributors with whom they have built close relationships. Has small sales staff that travels extensively in U.S., participating in regional tastings.
- **Small Focused Winery** — Main intent is to maintain a stable level of revenue and build reputation for selling high-end luxury wine to high-end customer segment. Product line includes two grape varietals with five labels; produces under 50,000 cases per year; owns vineyards, sells and buys grapes. Focused on selling 90% domestically through direct mail, Internet, Wine Club, and restaurant sales, 10% overseas in high-end restaurants in the United Kingdom, Germany, and Japan.

Obviously, there are other strategic combinations than the three described above. The key issue is to be clear about the particular strategy and vision for your winery. Once you know this, you can set appropriate financial goals for production, sales, and revenue. You should also revisit your strategy regularly to determine whether adjustments are required for changing business circumstances or a changing vision.

Analyze changing environment

The next step is to use the 10 business levers to continually analyze the competitive environment. Traditionally, wineries have done this only once a year in a strategic planning session with the board of directors. However, in this faster moving economy, it is useful to revisit the levers much more often — at least once each quarter. In this way, you can make the necessary adjustments to keep your winery on track. The key is to track the financial numbers for each of the 10 levers.

Changes in the business environment can rapidly affect your goals in either a positive or negative direction. For the most part, you have little control over these changes, which may involve legal/regulatory issues; distribution; competitor marketing campaigns; currency fluctuations; world events, such as 9/11; health news; changing customer demographics; taxation; and many others.

Since these external issues are difficult or impossible to control, you must proactively control their impact on your winery. That means you need to be continually scanning the environment and adjusting the levers on your control panel.

The 10 levers provide a means to analyze the strengths and weakness in your business model and recognize opportunities that will increase your likelihood of success. The following paragraphs describe each of the 10 levers and the shifts you can make with them to propel your winery to long-term profitability.

LEVER ONE: ***Your market***

To manage your market lever, you need to know your current market share and what you are targeting for the future. It is also useful to identify how your competitors are doing. Are they eroding your market share, or is there room for everyone to expand?

To adjust the market lever consider the following:

1) Brand/product position — Are you using a specific American Viticultural Area (AVA), single vineyard, a proprietary name, a county, or just a state designation? Where is there room to expand in your market? Are you estate grown, produced and bottled by; vinted/cellared and bottled by? Can you enhance this image?

2) Commodity or specialized — Do you have a replaceable grape supply that supports a given wine quality and price point, or are you limited by AVA or vineyard-specific constraints? Has the winery established a reputation for excelling in its production of a particular varietal, such as Cabernet Sauvignon? (In the current environment, it is recommended to move away from the commodity image.)

3) Brand development and reputation — How well is your brand known? What can you do to maximize brand identity and FOB?

All wine sales are not equal. Your winery cannot focus only on sales or depletions, because where the wine is sold is also important to long-term success.

Consumers must be able to find your wine; the on-premise or off-premise account where the wine can be purchased carries with it a certain image that affects other levers and your brand's long-term positioning. For example, if you are producing a luxury-category wine, you would not want to distort the image by selling it in a pizza parlor.

LEVER TWO: ***Sales and distribution***

Your sales program is based on your strategy and market position. To manage the sales lever, you need to set clear sales goals in specific markets, and then track the results. If you are not achieving your goals, then consider adjusting the sales lever using the following methods:

- Manage velocity — Are your sales too slow? Too fast? If too slow, consider some of the options outlined in the

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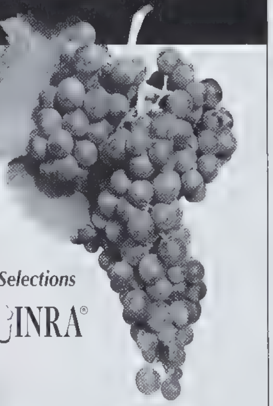

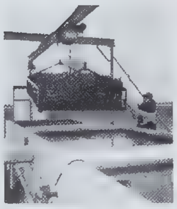

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inventory management lever. If too fast, manipulate the price or programming dollars.

Alternatively, if the winery has an aggressive growth plan and sales are booming, you may need to be prepared to utilize other sources of supply, such as the bulk market.

However, you must consider how this might affect consistency and quality, and what a shift in your marketing emphasis from a vineyard to AVA or AVA to state designation would mean. Supply constraints may limit one's ability to participate in certain programs or promotions proposed by a retailer.

- Extend the line — Instead of adding a whole new grape variety, consider how you can extend a current line. For example, if your low-end Merlot is selling well in part because of its fruit quality, margins could be improved if you take a portion of that fruit and redirect it into a new category at a higher price. This is easier and less expensive than producing a new variety and label. Or, if your high-end Merlot is not selling, declassify it to improve quality at the low-end and gain brand momentum.

Another important component of the sales lever is your relationship with your distribution network. It is important to form close relationships with your distributor and set up a win/win situation.

The big question in operating this part of the lever is: How do you get the attention you need from your distributors? How do you garner more attention from them than another winery or brand equal to or greater in size in the distributor's portfolio? How can you do this without lowering your bottle price and tarnishing your brand?

There must be a profitability component for the distributor as well, in order for them to have an incentive to promote your wine over a competitor's. Consider creative incentive options, such as depletion allowances, discounts, coupons, bonuses, and perks.

One caution, however, is to make sure your incentive method is legal in all of the states in which you distribute. Also make sure you track your sales numbers by region and use regional financial statements, so you have a detailed viewpoint of each market to support the big picture.

LEVER THREE: ***Material procurement***

This lever tracks the cost of your grape procurement, which changes as part of the cyclical supply side of the winegrape industry. It is a lever that should be monitored often. The major lever adjustment is in procurement flexibility.

If it fits your winery strategy, consider a diversified portfolio of grape procurement options. Either own some vineyards or negotiate grape contracts that give you viticultural control over the farming. In this way you may have the option of using the "estate grown and produced" designation.

Consider using both short- and long-term grape contracts, and/or buying from the bulk market when it makes sense. Include a floor and ceiling in a long-term contract to protect both the grower and winery. A multi-year weighted average base for pricing may also help smooth annual increases or decreases in the average.

Be sure that the use of the grape procurement lever fits your strategy and matches your brand positioning. It is imperative not to get "upside-down" with grape procurement. You don't want to be paying a premium for grapes in a declining market.

If you've been an estate-grown winery for the past 50 years, it would not make sense to erode your brand by buying bulk wine — even if the prices are good. However, if you want to extend your product line by creating a lower-end label, then the bulk approach is a possibility.

Bottling materials and the package presentation compared to the wine's price point should also be addressed.

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The issue of "real" versus "perceived" value enhancements comes into play. Value-added packaging may include French-type glass bottle, a punt bottom, branded corks, vintage-dated capsules, and printed cases.

However, while these components may help the image and support the price point of the final product, consider the costs. The waste associated with vintage-dated capsules will increase costs, while printed cases and branded corks may result in a loss of flexibility and increased costs of disposal should the inventory need to be sold through alternate means (finished goods sale to negotiant or private label, for example).

LEVER FOUR: *Facility and capital investment*

The ability to produce and raise cash is foremost in any business venture. Capital investment dollars come either from debt, equity, or operations. A business may have a formula, such as limiting capital to depreciation or requiring a minimum return on investment before any capital expenditure is considered. Whatever the formula, the cost of vertical integration, the decision to own or lease, and the life of the capital item are key elements to be considered.

The shareholders expect a certain return or savings from the investment. Based upon other cash constraints inside or outside the business, once the capital needs are prioritized, a decision should be made on how the capital will be financed.

Important factors that determine cost of capital for a business include: profitability, leverage, management team, the product's viability, sustained growth potential, and positioning. Assuming the cost to finance is reasonable, the winery needs to address the interest rate exposure discussed in the finance lever below.

This lever also encompasses the costs and benefits of vertical integration. What are the constraints of the facility (including land constraints) to expansion, permitting (potential public hearing), wastewater, and traffic mitigation issues?

Based upon the cost to rent versus build, an investment in a barrel storage building may have virtually no return on investment but could have a positive effect on wine quality, given a more controlled environment and less wine handling.

Conversely, a case goods warehouse that allows shipping from the winery could produce an extremely high return on investment given the savings in freight, warehousing, and related charges (offset by some investment in forklift equipment and personnel). Deferred maintenance must also be addressed, as these lower level priorities will now affect current earnings and operational efficiencies.

Once the route of facility expansion is taken, the efficiency of constructing in phases or all at once must be managed. A phased construction approach may be best, since less cash is required initially and the volume throughput can catch up to the new available capacity sooner.

While the total completed phased construction costs may be slightly higher, this cost is offset by the flexibility garnered from lower capital requirements, the more gradual increase in internal production, and the decreasing need to seek out third party production.

However, if it is determined later that there are some under-performance issues with the capital assets, then options, such as selling or renting out the assets through a custom processing arrangement, should be analyzed. Finally, the cost of property taxes and insurance on future operations must also be considered.

LEVER FIVE: *Production overhead*

Are you a high-volume, low-cost producer or do you have low volume and high costs? Production efficiency, facility volume throughput, and the resulting wine quality are all factors that affect margins. Facility constraints and investment in capital will also drive overhead.

Is the equipment properly sized for the operation and do the multiple com-

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ponents of different machines work effectively together? Is it more cost-effective to outsource certain aspects of production, or would doing so impact quality and thus make an investment in vertical integration more attractive? These issues link back to your strategy via main intent and customer segment.

For example, if you are a winery that prioritizes efficiency for large case production, then volume throughput and capital investment will drive overhead. Smaller wineries that focus on high-end customer segments and produce hand-crafted wines, may find they can only cut production costs to a certain level.

Therefore, production costs should be compared to budget and the volume being processed, and absorbing these costs should be reviewed in conjunction with the company's financial statements. Standard costs should be adjusted as necessary.

Lever Six: ***Human resources***

This lever tracks not only your general and administrative costs and their relationship to the entire operation, but also the effectiveness of the management team and principals. People are a tremendous asset to the winery, but the winery must be able to quantify the "bottom line" contribution made by each.

For example, the decision to add another sales person is not only dictated by your sales strategy, but by the increase in profitability that will be achieved as a result. The return on investment must justify the increase in head count. The leverage between the number of people required to produce additional sales and those total costs compared to non-personnel costs must be understood.

Unlike non-personnel costs, which may get favorable terms from vendors, personnel costs cannot be extended, so cash must be available. Costs should also be detailed between fixed and variable so that "break-even" can be measured.

To the first point, all costs should be separated between fixed and variable, and personnel and non-personnel. Break-even can be computed once the fixed and variable costs components are known.

Personnel and non-personnel costs assist with understanding cash flow. Personnel costs, production labor (included in inventory cost build-up) versus selling and administrative labor (principally current period expense), and contribution per employee (another return on investment analysis) are givens to determine your answer to the question: "Do I add staff or not?"

While your winery needs to be competitive in its benefit programs, these costs (on a percentage basis) have been rising at a faster rate than other expenses — and even more important — probably faster than the percentage of sales revenue growth.

Managing these costs is critical. At the same time, you must develop meaningful incentive programs to retain high performers and reduce the real and intangible costs of employee turnover. Using performance bonuses, rather than large increases in base salary is a prudent step — especially since employee salaries rose dramatically during the boom of the late 1990s.

Another human resource question revolves around your sales team. You may wish to contract with brokers for this key activity, but, at some point, the market managed by the broker reaches a scale that warrants investment in a full-time employee — even with the added costs of payroll and selling expenses.

The intangibles that the shareholders and senior management bring to the table are also important. What is their level of business sophistication and what business contacts or relationships can they leverage to maximize the bottom-line and grow sales? All of the issues associated with this lever should be considered and reviewed as necessary.

Lever Seven: ***Inventory management***

Unless you are using the bulk wine market as a primary source, inventory turnover in the wine business tends to be very slow. The winery must identify where the grapes will be used, coordinate cellar and production operations so that tanks are available, and get wine into barrels as early as possible to reduce the production cycle for a given wine as much as possible.

Reducing the time it takes to convert raw material into finished goods generally means a faster "return on investment" and ultimately enhanced cash flow.

Being "on vintage" in the marketplace is critical to realizing the full value of one's product. An age-worthy white wine is commendable, but if the consumer is not aware of this quality, and the winery intentionally releases its vintage wine later than its competitors, this could simply represent another marketing hurdle affecting the viability of its operations.

The ability to work within the framework of the industry's legal constraints is imperative. Subject to quality issues, varietal and vintage blending opportunities should be seized where possible to balance inventories and maximize turnover.

An important caution in this area, however, is to make sure there is quality wine in the bottle. If the quality isn't there, then you can have an even bigger inventory problem in the future.

Lever Eight: ***Finance***

Ideally, the amount of leverage and ratio of assets to liabilities on your balance sheet are manageable. However, one needs to assess interest rate risk

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between fixed and variable debt and the composition of short-term and long-term assets and liabilities. The seasonality of the wine business must also be taken into account with this level.

Cash flow needs to be reviewed, and the winery should have a strategy in place to deal with maturing debt or the timing of refinancing. Given current interest rates, you may want to consider discussing an interest rate swap with your banker or lender where the pre-payment penalties associated with refinancing fixed rate debt are punitive.

One vitally important component of finance is the quality of information produced internally. Each winery, no matter what size, has the same needs for financial and operational information. Evaluate your winery to assure that:

- The internal systems are adequate to produce accurate, timely, and necessary data that can be accessed and utilized throughout the entire organization (production, marketing/sales, and accounting).
- The winery can produce forecasts for income statement and inventory planning purposes, and can project balance sheets to know its peak borrowing periods and ensure compliance with loan covenants.

LEVER NINE: *Marketing*

Wine writers are just one component of media relations. Don't discount the effect of a positive review, but recognize that many wineries continue to excel without receiving high scores for their wines in select publications.

What is critical to remember in managing this lever is that the criteria for your investment in promotion are no different than for an investment in capital — some return is expected.

Although they offer a potential long-term benefit, media dollars are expensed currently. To determine the appropriate media and obtain the greatest return on investment, you must clearly identify the target audience and the purpose of the expenditure. Is your purpose to promote the brand image in the wine trade or in consumer publications? Is your target the distributor, retailer, restaurateur or consumer?

Wineries should use their business strategy as a basis for identifying where they want to spend PR and advertising dollars. Then they should analyze the results. In using this lever, they need to decide when and where to shift their promotional spending focus. Sometimes the smaller and more consistent PR events provide the largest return on investment.

LEVER TEN: *Legal*

The legal lever includes the need to focus on sustainability issues from environmental, social, and community perspectives. As a responsible corporate citizen, wineries must consider the effect of their operations in all of these domains.

The winery's values, ethics, and compliance with legal matters are intangibles that promote goodwill and a positive brand image. Focus must always be paid to this lever to promote the long-term health and success of the winery.

Conclusion

With prudent management of the 10 levers, you can positively impact the performance of your winery. Though the results may not be immediate, you will find that consistent focus in these areas over the long-term will enable you to achieve the financial agility and profitability that you desire for your winery. ■

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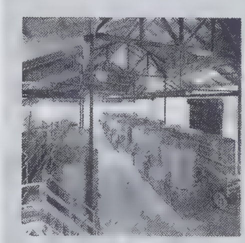
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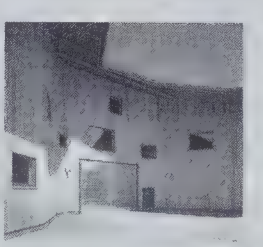
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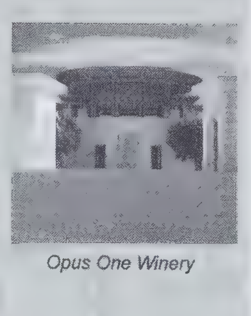
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IN THE CELLAR *by Jake Lorenzo*

Heavy bottles, Latino-owned wineries

Jake Lorenzo, private eye, and his friend Chuy Palacios are deep in thought and halfway through a bottle of 1999 Syrah. "Jake," Chuy admonishes, "it's a great case. Working on behalf of the downtrodden, the *trabajador*. What's more working man than garbage?"

"No way, this detective doesn't work with garbage. I don't see the up side. It's a case we can't win."

"What about Lenny's back?" screeches Chuy. "He's got a family to support, and his back hurts. How are you supposed to be a garbage man with a bad back?"

"Chuy, *calmaté, amigo*. We'll get him a job driving one of those trucks with the hooks that pick up the garbage cans. That way he can just sit and pull some levers. OK?"

"No, it's not OK. What about the next garbage man? What about his back? We got to go after those deep-pocket slime that caused this whole problem."

Jake Lorenzo pours some more wine and lets his friend rant. Chuy is incensed because his friend, Lenny "The Garbage Man" Acosta, hurt his back dumping wine bottles for recycling. Some trend in wine packaging has dictated that fatter, thicker, longer, heavier bottles are sexy.

In the frenzy to develop the ultimate wine package, wineries have developed a stable of incredibly heavy, awkward, non-functional bottles. The bottles don't stack, won't fit in a wine rack, and cause more wrist injuries than a sado-masochistic carpal tunnel convention.

For years a case of wine weighed 35 pounds. Ask any trucker. Now, cases are closer to 45 pounds. That works out to about 200 cases less per container (if you're trying to be legal). That translates into more loads, more gas, more trucks on the road, and more pollution in the air.

Wineries are talking out of both sides of their fermentors. On one hand, they work to be ecologically correct with organic farming, mulched waste products, and clean water systems. On the other hand, they spend thousands of dollars for heavy glass that sucks up fuel, leads to pollution, and ruptures discs in the backs of garbage collectors.

Jake Lorenzo says get with the program. You sure as hell don't want Chuy Palacios serving papers for some class-action suit on behalf of the garbage workers, who, by the way, are unionized and part of the Teamsters. Piss them off, and none of your heavy wine bottles will move across the country at all.

* * * *

Jakelyn's mom and I went up to Seattle to visit the kids last month. The grand baby is growing up. She's eight years old now and has a pet snail. Turns out that snails make great pets. They eat very little, make no noise, and are fun to watch, if your idea of excitement is watching the occasional bubble blow up from a trail of slime. It works for the grand baby.

We went to her school for a visit, and Jake Lorenzo was confronted with another sign of old age. Think back to when you were in elementary school, and all that time you spent making circles and loops preparing to learn cursive writing. Writing is out. Eight year olds spend an hour a day practicing their keyboard skills, but they ain't working on no stinkin' handwriting. Handwriting is destined to become the 21st century equivalent to Latin in school curriculums.

Fortunately, our granddaughter is learning Spanish. When you realize how many Latinos live in the U.S., you've got to be crazy not to teach your kids Spanish. It's a simple matter of economics. Ten years from now, when the economy is much tougher for us than it is now, the competition for jobs will be fierce. Most of our kids will have similar education, but the Latinos will be bi-lingual. In the global economy, who would you hire? Jake Lorenzo is going with the person who speaks English and Spanish. Wouldn't you?

* * * *

Speaking of Spanish, Jake Lorenzo is delighted by a new trend in the wine business. Clearly, it was just a matter of time, but we now have a few Latino-owned wineries. Now, I don't know if the Hispanic culture traditionally holds private detectives in high esteem or if they respect my love of Mexican food or if they are enamored by my attempts to speak Spanish, but Latino wineries send Jake Lorenzo samples of their wine. *Graciás a todo.*

Jake Lorenzo loves the sound of a UPS truck screeching to a halt in the gravel out front to deliver a box of wine samples. It's like mid-afternoon Christmas, and it happens all too infrequently. The only truck sound I like better is that of garbage trucks in the morning, especially when they dump that blue recycle container and I can hear all my empty wine bottles crashing into the bin.

Anyway, I'm currently tasting my way through the Robledo Family Winery samples. Their press kit explains how Reynaldo Robledo came to California when he was 16 years old. Two years later he was running a vineyard crew of 35 people. From there he managed vineyards for Sonoma Cutrer, started his own vineyard management company, bought his own vineyards, and finally opened his own winery. All these various businesses are operated by his seven sons, his two daughters, and his winemaker son-in-law.

The wines are pretty good, with a lovely, lively Sauvignon Blanc that sells for $12. Their first Pinot Noir shows a classic cherry, dried violet nose that speaks of Carneros. Even the Chardonnay is rich with a near perfect balance between fruit, creaminess, and oak, (and you know Jake Lorenzo's views on Chardonnay.)

Other Latino-owned wineries include Ceja and Mi Sueño. Jake Lorenzo says you should check out their wines. If every winery bought just one case from each of these Latino-owned wineries, we could help guarantee their success, and their success would be a good thing for the wine business.

We all know that if it were not for Latinos, there would be no California wine business. We should support these fledgling producers and encourage more Latinos to produce wine. Hell, maybe they'll soak up some of that grape glut that everyone talks about.

I hope that eventually there will be enough Latino-owned wineries for them to form an organization, sort of Hispanic Rhône Rangers. Believe me, that's one organization that will find Jake Lorenzo attending all of the meetings. The food promises to be fantastic. ■

CALENDAR

American Society for Enology & Viticulture
54th Annual Meeting
June 17–20, 2003, Reno Hilton, Reno, NV

"The sessions on the effects of viticultural practices on wine composition and progress on grape disease are timely to optimize quality in a competitive marketplace," says Signe Zoller, program chair for the 2003 Annual Meeting. "The sustainability session on June 20 will be of particular interest to many viticulturists, given the continued overlapping of vineyards and residential lands. The yeast fermentation biology session should be especially valuable since it will shed light on many outstanding issues concerning the achievement of successful fermentations."

Tuesday, June 17
8:30 am — 5:30 pm: Warm Climate Grapegrowing and Winemaking Symposium

Wednesday, June 18
8:45 am – 11 am: Color and Phenolics
9 am: Dr. Roger Boulton, professor of enology at UC Davis, will present the ASEV Honorary Research Lecture.
10 am – 11 am: Viticultural Genetics
1:30 pm – 3:45 pm: Effect of Viticulture and Enology Practices on Wine Composition,
3 pm: Dr. Mark Kliewer, professor emeritus of viticulture at UC Davis, will make the Merit Award presentation.
Trade Show on Wednesday (10 am – 5:30 pm) and Thursday (10 am – 4 pm)

Thursday, June 19
8:30 am – 10:30 am: Yeast Fermentation Biology
8:30 am – 10:15 am: Progress in Viticultural Diseases
1:30 pm – 2:45 pm: Wine Chemistry and Microbiology

Friday, June 20
8 am – 4:30 pm: Science of Sustainable Viticulture

For more information: tel: 530/753-3142; fax: 530/753-3318; e-mail: society@asev,org: website http://www.asev.org/: www.asev.org.

American Society for Enology & Viticulture
Eastern Section Annual Meeting

July 8–11, Tuesday–Friday
Radisson Hotel Corning, Corning, NY
Includes "Wine Closures: Put a Cork in it?" Symposium with confirmed speakers: Terry Acree, Cornell University, NY; Mark Bassel, APM; Bob Fithian, Cork Quality Council; Leigh Francis, Australian Wine Research Institute; Ken Fugelsang, Fresno State University; Jürg Gafner, Swiss Federal Research Station for Viticulute & Enology; Wolf-Rüdiger Sponholz, Geisenheim Research Institute; Chris Stamp, Lakewood Vineyards, NY.

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SMART VITICULTURE *by Dr. Richard Smart*

"V" is for white and warm

Most readers will be familiar with the idea that red grape varieties appear more tolerant of hot growing conditions than do white wine varieties. This column, however, will describe four white wine grape varieties that I think could be grown well in warm-to-hot grapegrowing regions.

There are many white varieties that, when subject to warm-to-hot growing conditions, produce wines with atypical flavor profiles. Riesling and Gewurztraminer are good examples of this phenomenon. Chardonnay, on the other hand, is capable of expressing varietal character over a range of climates.

The four varieties that I think show potential for planting in warm-to-hot regions have all impressed me at one time or another. The coincidence of their names all beginning with "V" struck me as a suitable jumping off place for this column. Certainly, there are other white varieties that can do well in warmer regions, Semillon being one of them. But let us keep our focus here on the "V" quartet: Verdejo, Verdelho, Vermentino, and Viognier.

The roots of this topic go back a couple of years, when I visited a winery near Rueda, Spain, belonging to two ladies called Victoria. Their winery name was the "Dos Victorias." They grew Verdejo, and we were discussing other white varieties that might be suitable for their site. I came up with "Four Vs for the two Vs."

Many readers of this column may already have dismissed the topic of four Vs out of hand. They will see only one name on the list which they recognize (Viognier), and immediately dismiss any other new varieties as being unmarketable. I hear this argument often; my retort is that around 30 years ago Chardonnay was a relatively new variety…

I believe that in the coming decades the international wine industry will begin to look to more rather than fewer varieties, and that the tendency to plant a handful of so-called "international" varieties will be reversed.

One feature of my international consulting is that I often come across indigenous varieties, and I am generally impressed with their quality. It reminds me that there are potential new varieties that have thus far failed to get recognition, most likely because of their origin rather than any quality defect. I am unaware of any grand evaluative tasting that has selected our few "international" varieties above all others.

Verdejo

Verdejo is a Spanish variety, from the Rueda region of northwest Spain. This region also grows Sauvignon Blanc, and the two varieties are often blended. In passing, I note that Rueda is a relatively hot region, but that Sauvignon Blanc makes very good wine here, better than one might expect based on its performance in other hot regions of the world.

Verdejo wines are aromatic, but with very good body and extract. I personally think that they can be like a good Semillon in the body. Interestingly, the wines can age well, developing a nutty character.

Verdelho

This is a Portuguese variety that apparently has its origins in the sweet wines of Madeira. Its ability to make a full flavored dry wine might never be known were it not for its accidental introduction to western Australia.

Vignerons of the hot Perth region soon found that it made white wines with pleasant lemony characters, and the aroma was not diminished by hot growing conditions. Verdelho was thus often blended with Chardonnay, Semillon, or Sauvignon Blanc, into a style that has become known generically as "classic dry white."

There is possibly some naming confusion about Verdelho, and Portuguese nurseryman Jorge Boehm is planting it and vines of similar sounding names from many countries side by side to reveal relationships.

Vermentino

My first encounter with this variety was on the Italian island of Sardinia. Interestingly the grapes were grown on an overhead trellis, and I first saw the must in a hyper-oxidation settling tank. I could scarcely believe my taste buds when I then sampled the previous year's wine. How could such a brown must produce such a lovely green-yellow colored wine, with such a lovely aroma?

The wine had a very fragrant and floral nose, which is one of its features, as is good acidity. Vermentino is grown on Sardinia and also in Liguria, around Genoa. Recently it was approved and planted in Languedoc-Roussillon of southern France. Vermentino may be related to the Malvasia family of Italy and the Iberian Peninsula.

Viognier

This highly fashionable grape can be said to have now "made it" in terms of international recognition. Its origin is in the northern Rhône — or at least that is the region where it became famous. Last year, I was told there that the variety may have originated elsewhere. It is most famous as a white wine in the tiny appellation of Condrieu, and is also blended with Syrah wines in Cote Rotie.

Viognier is seen by many as a possible complement to Chardonnay in warm-to-hot regions. The aromas are strong and distinctive, which Jancis Robinson, author of the excellent book *Guide to Wine Grapes*, identifies as perfumed and redolent of apricots, peaches and blossoms.

When exposed to sunlight, the fruit turns a beautiful golden yellow, and the wine can be well colored with full body. One Viognier vineyard that has particularly impressed me is the R.H. Phillips Vineyard near Sacramento, CA. Here the vines are trained to a well-managed Smart Dyson trellis. From a distance it seems like an 8-foot-high green wall, with two yellow bands (of fruit) along the middle. It is indeed a lovely sight.

Other "V" whites?

Jancis Robinson notes a few other white varieties that begin with "V." I have tasted Verdichio of central Italy, on the Adriatic coast, which can be impressive. This variety produces crisp, acidic wines with lemon characters. Had I seen more of this variety I might have added it to the list.

Robinson also is enthusiastic about Verduzzo from the Friuli area of northeastern Italy. It is made into both dry and sweet styles, the latter being a wine of distinction. Vernaccia is another Italian white variety, which produces distinctive wines with full body in San Gimignano of Tuscany.

Vernaccia is a Tuscan white variety. It is impressive with a full body, and some producers are now doing barrel ageing. I don't know how it might perform in warmer climates.

Veltliner or Gruner Veltliner is an Austrian wine that impresses me very much. Austria has hot summers but cold winters. Veltliner is the most important variety in Austria, and the wine has distinct peppery characters. While best drunk young, the wine also ages well into a white Burgundy style. Had I seen the variety growing in traditional hot regions I would have been very tempted to add it to the list above.

Finally, there is another candidate from Portugal: Viosinho. This is a white variety grown in the hot Duoro Valley that produces acidic wines.

I checked the FPMS web site for U.S. availability, which shows Verdelho, Viognier, Vernaccia, and Green Veltliner. Some enterprising nursery man might import the others.

Conclusions

There are undoubtedly vignerons in warmer parts of the U.S. looking for white varieties that will make good wine in hot climates. The four varieties I have suggested do well and are established performers. They are all worthy, but there is no reason to stop with them. Perhaps some of the even more obscure varieties will also delight you! But remember my tip: V is for white and warm… ■

Dr. Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Australia. He is also a visiting professor of viticulture at Cal Poly, San Luis Obispo, CA. Contact him by e-mail: vinedoctor@compuserve.com. Read about Dr. Smart's business, including his consulting schedule, educational wine tours, and seminars, at his home page, www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/838-6312 and www.vinquiry.com

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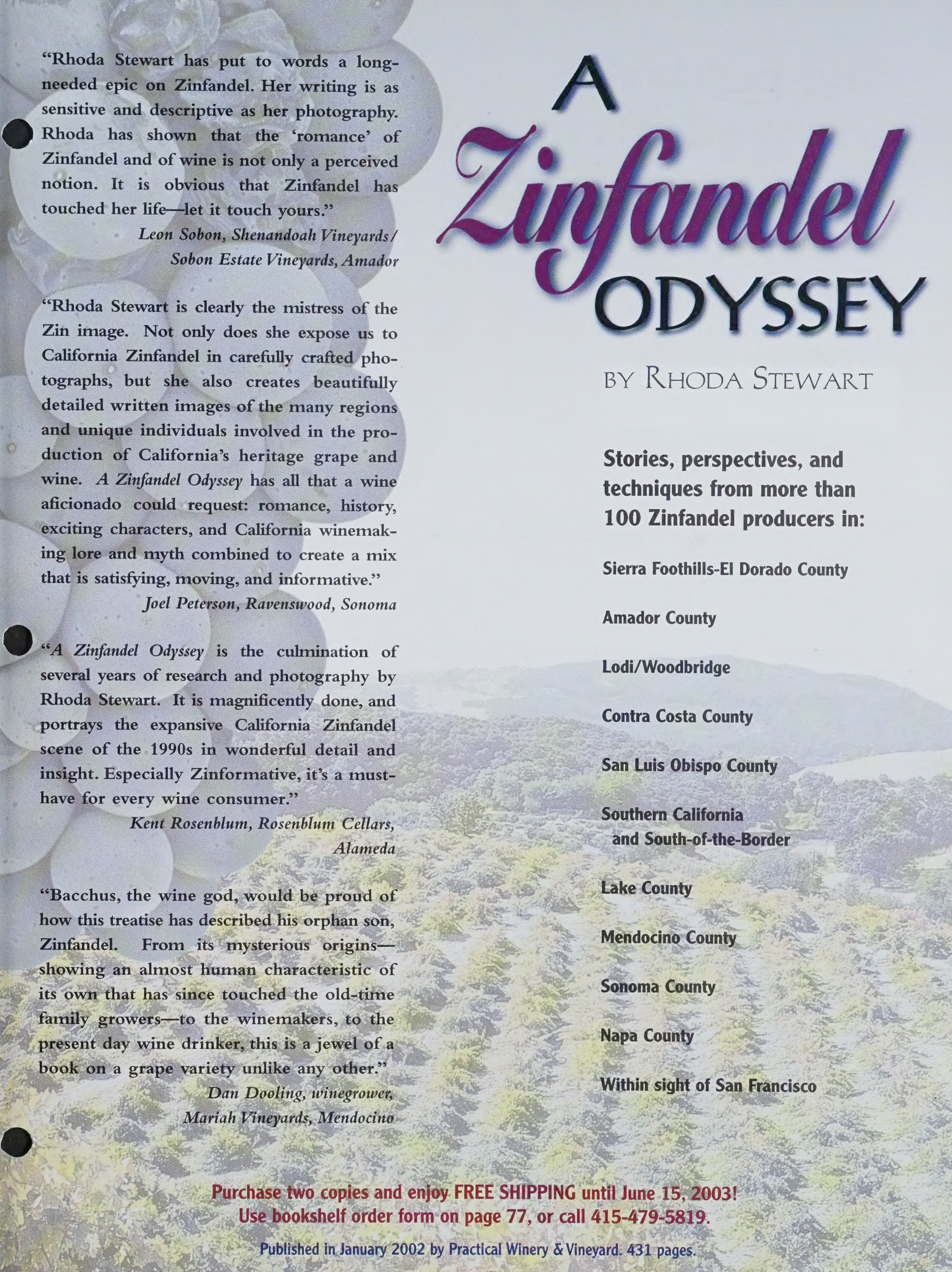

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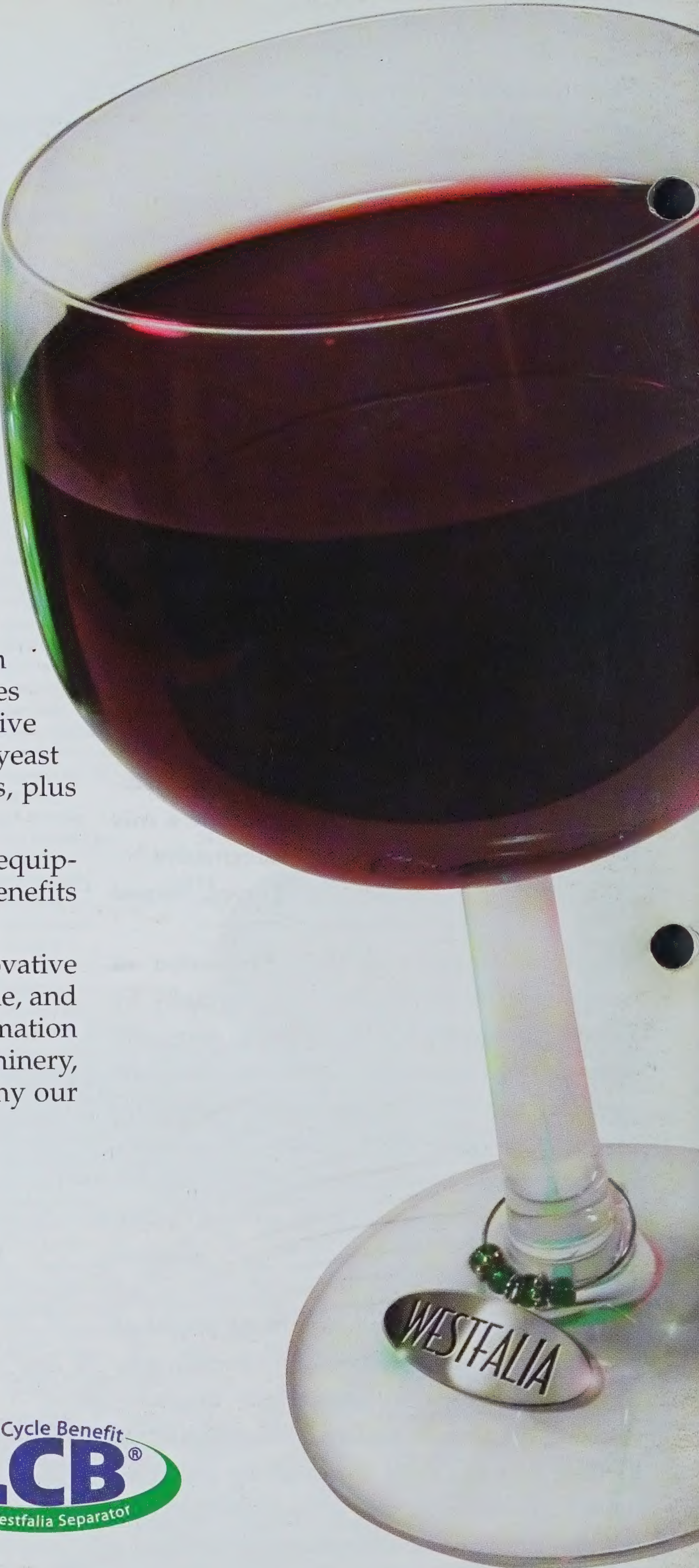

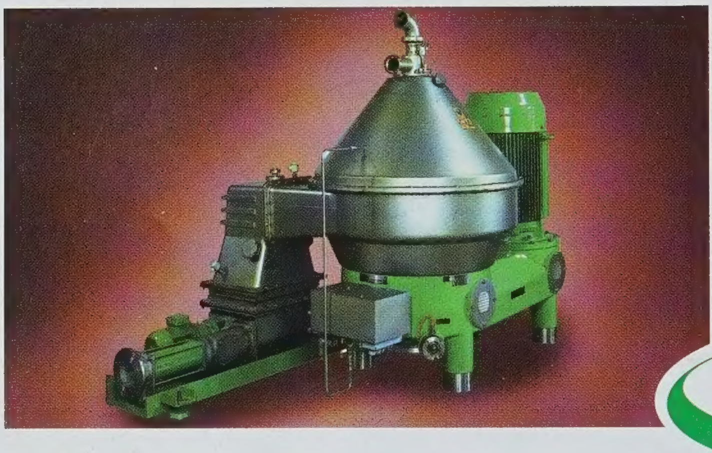

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